EXHIBIT No. 12

SUPERIOR COURT OF WASHINGTON
IN AND FOR KING COUNTY

LAURA D. WOLF, a single person,)
)
Plaintiff,)
)
vs.) No. 12-2-11026-3 SEA
)
MELISSA STEVENS and JOHN DOE)
STEVENS, husband and wife and the)
marital community comprised)
thereof,)
)
Defendants.)

DEPOSITION UPON ORAL EXAMINATION OF BRADLEY W. PROBST

10:00 a.m.
Thursday, August 8, 2013
1215 Fourth Avenue, Suite 1700
Seattle, Washington

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EXAMINATION INDEX

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EXHIBIT INDEX

EXHIBIT INDEX (Continued)

(Exhibits 1 and 2 marked for identification.)

BRADLEY PROBST, being first duly sworn by the Court Reporter, testified as follows:

(Deposition commenced at 10:05 a.m.)

EXAMINATION

BY MR. ELDER:

Q Mr. Probst, I'm going to show what's been marked as Exhibit Number 1, and that's a subpoena duces tecum that we sent over for this deposition. Did you receive that?

A Yes, I did.

Q Did you bring some documents that are responsive to that subpoena?

A I did.

Q Let me ask you specifically before I kind of get the whole bunch, did you manage to find copies of those articles that are listed in item number ten?

A I did.

Q And did you bring those?

A I did.

Q Did you bring along copies of your reports that you've authored from January 1st, 2011 to present?

A I have not.

Q And is there a reason that you did not bring those?

A I, one, don't have any means by which to just know which

ones I have produced or authored or a date or anything like that, it's just not any way in which I file anything.

Q How do you keep your reports? First of all, when you sort of author them, do you do it on a computer?

A Yes.

Q It looked to me like a computer. And do you have a saved file that you save for each report that you generate?

A Correct.

Q And how do you file those? Do you have like a computer system where you have a number of different folders and then each folder you keep the documents that are for that particular file or case?

A Honestly, I don't know because I send them into a report editor who finalizes the report, then they are sent out from there, and I know that they store them on a corporate server, but how and where, I don't know because I don't actually do that process.

Q Who's your report editor?

A Generally it would be Laurie Renner.

Q And is she an employee OF ARCCA or is she employed by somebody else?

A ARCCA.

Q Now, when I look at your report it's got a signature on it. Are you actually signing these things in pen or is that just an electronic thing that somebody else puts on there?

A Generally it's electronic. There's certainly times where it's an actual signature, but if they're being done, as I said, by a report editor just to finalize them, I think they place an electronic signature.

Q I'm going to show you what's been marked as Exhibit Number 2, which is your report in the Laura Wolf case; is that correct?

A It appears to be the report in this matter, yes.

Q Sir, are you telling me that after you wrote the report yourself, that it gets sent off to somebody else, they make changes to it, and then affix your signature, but you don't actually see it during that process?

A That's not what I said.

Q So clarify for me. You send it off to an editor, but I think somewhere in there I think you said that you don't actually keep a copy of the final report; is that correct?

A Correct. The editor looks at it for spelling, grammar, somebody else might look it for technical accuracy, it's sent back to me, I make revisions, send it back to the report editor who then finalizes it, makes it -- formats it, all those wonderful things, and at that point the signature is affixed and it's sent out.

Q So do you have electronic files on your computer of the unedited reports that you're authoring?

A Not to my knowledge. There might be some that inadvertently

are there, but generally I don't keep any copies. It's just I send it to the report editor and then it's finalized.

Q Like if you sat down on your computer at work, you couldn't pull up the electronic version of Laura Wolf's report?

A I probably could if I looked for it, sure.

Q And what about the other reports that you've authored from 2011 to present, couldn't you just sit down at your computer and pull up the electronic versions of those?

A If I knew what those reports were, it's possible. I don't have a list of anything -- I don't keep a list of what I've authored from any time to any other time or what I did author or did not author. It's just not a list I have, so there's no way of me searching for something like that.

Q Well, aside from coming up with a comprehensive list, can you identify any reports that you've authored other than Laura Wolf's report from January 1st of 2011 to present?

A Certainly probably the ones I've been working on this week, but I don't know if there are any under protective order or what the status is or I don't know if I'm free to release those to you at this date.

Q Are you aware of any reason that you cannot release them to me?

A I don't know. I simply don't know if I can or can't, so it's safer for me to not release them than to violent something and release them to you.

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Q Has anyone instructed you that there are protective orders that mean that you cannot release the reports that you generate when you receive a subpoena?
A I don't know. It's not something I generally ask or it affects how I do my work, so it's not something again I ask or have any knowledge of.
Q Well, let me ask you this. Do you have a standard naming convention when you write reports as to what you title them? For example, maybe you would call this like Wolf, comma, Laura, and maybe add a date to it and save the file as that name?
A I think the report editor finalizes it. I think it's usually what we have here. You can see up in the heading we have a case number, and then generally there'll be a case name, and generally, depending upon who's retained us, but in this case it would probably be called like Wolf or Laura Wolf.
Q And do you make any special designation for it to reflect the fact that this is your report for Laura Wolf as opposed to maybe a correspondence?
A No.
Q Could you do a search on your computer and find your reports that you've authored from January 1st, 2011 to present?
A I don't know. I've never attempted that.
Q When you transmit your reports to an editor, how do you do

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that?
A Through e-mail.
Q So could you just look through your e-mails and see what reports you've sent out to the editor from January 1st of 2011 to present and thereby determine which reports you've authored during that period of time?
A It's possible. Again I don't know. I sometimes edit other people's reports and send them back, so I'm not sure if it would fully show what I have authored or what I've reviewed that are authored by others, but it's possible. Again, I haven't performed that search. I don't know if it's possible.
Q Could you do that for me when we stop for today? Because I would like to see your reports from January 1st, 2011 to present in this case. If you tell me that you've tried and that you've come up with some, but you can't tell me with a hundred percent certainty that that it is every report that you've authored, that would be more satisfactory than telling me that you haven't even tried to find them. So I would like you to make that effort to see if you can find any of your reports, okay?
A Well, first I have to see what's even possible and what it would entail doing, and then what it will entail from any people that have possibly hired us. So I can't say as I sit here today how quick and easy that is of a task to do. It's

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certainly something that I can look into and I'll let you know what we can and cannot do.
Q Where is your editor physically located? Is she here in Seattle, is she somewhere else in the country?
A Somewhere else in the country.
Q Where is she?
A In Pennsylvania.
Q And is that sort of your firm, ARCCA's headquarters?
A Correct.
Q And let's talk for a minute about the physical files that you have. Do you keep physical files, like hard copies, printouts of the reports that you generate?
A I do not, no.
Q So back at your office did you have a copy of Laura Wolf's file in hard copies?
A I did not, no.
Q Do you have a copy of Laura Wolf's report that you authored with you today?
A I do.
Q Where did you get that?
A That was off our corporate computers.
Q So you have access to the corporate computers?
A Correct.
Q And if you know the names of the files that you're working on or the file numbers, you can get copies of the reports?

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A Yes.
Q Now, as I understand it, you use a computerized billing system to enter your time for the work that you do; isn't that correct?
A Correct.
Q Could you use the computerized billing system to determine what cases you've worked on from January 1st, 2011 to present?
A Again, I don't know. I just use it to enter my time, so I'm not sure what the capabilities of that system actually are. It's possible, I just don't know. I've never attempted that.
Q But at this point you haven't tried to see which cases you've worked on from January 1st, 2011 to present; is that fair?
A Again, because I'm not sure what I am allowed to release or not release or how I'd go about doing it, it's simply not something I've ever done before. I don't have a list, so I don't have anywhere to start with, so...
Q Well, you have produced in the past a list of all the cases that you've testified in and provided deposition testimony or arbitration testimony; isn't that true?
A That's correct.
Q And that would include a list of various cases that you've issued reports in?

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A Possibly. There's certainly times in which I haven't authored reports in various states, so that list alone just tells me where I've testified, not any other additional work that I might or might not have performed.
Q Okay. Can you hand me the documents that you have brought that are responsive to the subpoena?
A Basically it's everything I have here today.
Q So let me ask you a few questions about the report that you authored for Laura Wolf. First of all, does this report contain your opinions that you formed based on your investigation and analysis of this file?
A Correct.
Q And have you reviewed it in preparation for your deposition today?
A The report, yes.
Q Do you have any changes, edits, modifications that you found were appropriate when you reviewed it?
A Not that I'm aware of, but it could be. I can't see the forest for the trees because I'm re-reviewing what I've already authored, so there certainly could be something I'm overlooking, but because I'm reading it in a different light, I don't notice anything significant.
Q When you authored your report you knew that this case was in litigation; isn't that true?
A I was under the assumption that it was, yes. There was, I

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think, a deposition, at least, so obviously it appeared as if it was.
Q And you knew that people would be making decisions on this case based on the report that you authored?
A Honestly, I just know that somebody asked me to produce a report. What they choose to do with it, that's up to them. So I end it where I produce a report and I allow somebody else to use it as they see fit.
Q When you expressed your opinions in your report you tried to be fair?
A I'm simply presenting facts and scientific evidence.
Q You tried to be fair?
A Again, I'm simply presenting facts and information. I'm not picking sides or doing anything. Just presenting scientific information.
Q And you try to be as accurate as you can be?
A Certainly.
Q You try to express all of your opinions?
A I express the opinions that seem relevant. Obviously, I don't know what might or might not be asked at time of trial or what might change as the matter proceeds, but at that point in time those were my relevant opinions.
Q And it sounds like when you're hired on to a case you don't try to present any particular perspective in terms of taking sides or presenting a defense perspective or a plaintiff's

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perspective?
A Again, as I've answered multiple times, I'm simply presenting scientific facts.
Q Do you ever hold yourself out as being someone who defends motor vehicle cases, collisions?
A I do not. But obviously as I sit here today, I'm working on the defendant's side, so somebody could make that implication, but I don't state that I'm working as a person of one side or the other.
Q Have you ever held yourself out as someone who defends motor vehicle cases?
A A similar answer. I've never stated that I do one thing or the other, but obviously yes, I have worked where somebody has used my information in defending a motor vehicle accident.
Q What about your company, ARCCA? Have they ever marketed or held themselves out or advertised themselves as being a company that should be hired to defend motor vehicle cases?
A It's certainly possible. I mean, they can market the company as they see fit. I'm not in charge of the marketing, so it's certainly something that they could choose to do.
Q You use a term in your report, biomechanical failure. What do you mean by that?
A Basically it's a mechanical failure that's biologic in

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nature.
Q Do you mean the same thing as injury?
A No. I mean specifically mechanical failure that's biologic in nature.
Q What's the difference between biomechanical failure and injury?
A I would have to ask you to define injury.
Q Do you use the term injury?
A Certainly at times I use, from a medical point of view, that they say somebody has been injured.
Q Sometimes you use the term biomechanical failure, sometimes you use the term injury; isn't that fair?
A Well, it depends on what context. Sometimes it's a quote that somebody claims they were injured or something from another report, but certainly it's possible we use the term injury.
Q What's the difference in the way that you use the terms biomechanical failure and injury when you use those terms?
A Again, it would depend upon the context in which they were used to begin with.
Q Do you use those terms interchangeably?
A I try not to because specifically, again, trying to allow the readers of the report to understand exactly what we're doing, I attempt to say biomechanical failure just so there's no confusion as to what I'm actually doing or what

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I'm analyzing or what my opinions are.
Q Do you believe that it would be improper to use them interchangeably?
A Again, it depends on the context. It's possible they could be. It depends upon your definition of injury.
Q Let me ask you this. You've authored a number of different reports over the years. Have you used the terms biomechanical failure and injury interchangeably?
A I don't know about interchangeably, but as I said, I think I've tried to use biomechanical failure much more so now because there appears to be some confusion as to what biomechanics is and what a biomechanical failure is. So again, just to be precise and specific I attempt to say biomechanical failure.
Q You don't hold any healthcare credentials from the state of Washington, do you?
A I do not.
Q And you don't hold any healthcare credentials from any state?
A I do not.
Q You're not authorized to diagnose and treat injuries?
A Not licensed, no, but again from a biomechanical point of view and educational background, it's certainly something that we've done quite a number of times and been allowed to testify to quite a number of times as well.

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Q Let me be clear. Can you diagnose and treat injuries?
A Not treat. I apologize if you said treat. I'm talking about diagnosing. Certainly in the world of biomechanics we have to understand what has occurred, so to some people that's called diagnosing an injury. We're specifically looking at forensically what has occurred.
Q So you believe that you can diagnose injury?
A Again, through education, training, background, and prior testimony it's certainly something I do. It's not something -- I'm not doing it for the public, I'm not working as a medical professional. I'm doing it solely from a biomechanist's point of view.
Q In the first paragraph of your report you wrote, Your firm retained ARCCA, Incorporated, to evaluate the subject incident in relation to the forces and claimed biomechanics involved in the incident of Laura Wolf.
And I just want to ask some clarifications about that. First of all, do you believe that some biomechanics were claimed?
A Certainly.
Q And who are they being claimed by?
A Well, Laura Wolf or whoever is representing her. I'm not sure what she has specifically stated, but the documents that I have received for her.
Q And what biomechanics are being claimed? Describe the

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biomechanics that are claimed.
A Well, obviously, parts of it is her physical movement inside the vehicle, again the forces that were placed upon her, and then as we note later in the report, any biomechanical failures that are being claimed as a result of this.
Q Has Laura Wolf ever claimed any biomechanical failures?
A Certainly, yes.
Q What biomechanical failures has she claimed?
A They are well documented in my report starting on page three. Well, simply just on the bottom of page three.
Q And so what you're talking about is cervical spine strain/sprain, thoracic and lumbar spine sprain/strain, and right shoulder rotator cuff tear?
A Correct.
Q Aren't those the injuries that she's claiming?
A These are biomechanical failures, as I note.
Q I don't think she's ever called them biomechanical failures. I've never called them biomechanical failures. She said that she was injured and these are her injuries, her doctors have said that these are her injuries, but I haven't heard anyone call it biomechanical failures but you. Did you see any reference to anyone calling this a biomechanical failure other than you?
MR. NYE: Object to the form.
A Again, as it states here, according to the documents this is

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what's reported in her records that these are the biomechanical failures. Again, I'm looking at it from a biomechanical point of view. That is what's in those documents.
Q In any document do you see anyone ever call this a biomechanical failure?
A I don't recall. I have hundreds and hundreds of pages of documents. I don't recall honestly.
Q Is that a term that doctors typically use?
A I don't know if I've seen it quite often. Generally not. It might just be noted as sprain or strain or something like that.
Q You indicate in your report that you have experience with testing on human subjects. Describe for me what testing on human subjects you have experience with.
A Well, it's a very broad question, but I have conducted testing on live human subjects looking into low accelerations, high accelerations, the effect of forces placed on the body. Just again, the easiest way to say it is biomechanics of the human body. Your question is so general it's difficult to answer.
Q Have you authored any papers based on human test studies involving human subjects?
A If I could look at my file I might be able to see if something reminds me. Some of these, obviously, we had

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performed some live human testing. I don't know if it's actually in the reports, but certainly a number of these papers that I've authored, some form of live human subject testing has been performed looking into these various subjects.

Q Which articles?

A Well, certainly the first one noted, A Three-Dimensional Nonlinear Kinematic Finite Element Model of the Human Cervical Spine Under Dynamic Inertial Loading. The second one, Seat Design, A Risk/Benefit Approach. And the fourth one, I think it's the same title as the first, A Three-Dimensional Nonlinear Kinematic Finite Model of the Human Cervical Spine Under Dynamic Inertial Loading. I could be mistaken, When Driver Safety Fails, Then What, Vehicular Accident Analysis, The Big Picture. Again, I know we've done some slip-and-fall analyses. I'm not sure if it was in this paper, but Biomechanics for Risk Managers, Analysis of Slip, Trip and Fall Injuries. And then Performance of Automotive Seat Belts During Inverted Negative Gz Rollover Drop Test.

Q How many human subjects did you use in each of these studies?

A As I sit here today I don't know. I can't say. And again, it might not be specifically for that report, but in a bigger picture study of those events and scenarios, again

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certainly we've conducted live human subject testing. I don't know specifically for those reports.

Q Do any of those reports identify specifically how many human beings were tested as part of generating that article?

A Again, I don't know as I sit here today.

Q Have you participated yourself in any crash tests involving automobiles where you were inside the vehicle during the crash test?

A I don't recall with a full-scale vehicle. We certainly have used parts of vehicles where we've done live human testing, and certainly I've been involved in that, but I'm not sure about an entire vehicle, if you will. Certainly sometimes we're looking at just we might only use the seat, we didn't need the entire vehicle to do the type of testing we're performing.

Q You're talking about situations where you're the one sitting in the seat during the test, during the crash; is that right?

A We're not always looking at crashes. There are certainly other things we're doing with live human testing.

Q Let me go back and ask this again. Have you done any automobile testing involving crashing where you've been inside either the vehicle or the seat that's replicating a crash?

A Can you be more specific by what you mean by crash?

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Q Something that's involving forces to -- either a crash itself or something to replicate the forces of a cash where you're the one that's actually sitting in the seat.

A That's why I asked you to define that because where you said just replicating forces, we've certainly done events like that.

Q And I'm not talking about "we", I'm talking about you.

A The royal we and the company I work for involving me. Obviously, we don't do these tests solely by ourselves. Generally there's multiple people involved. So "we" meaning myself and others, and one myself being a participant as well.

Q So tell me about the tests that you've done where you're the participant, Bradley Probst. I'm not curious about everybody else, just you for this question.

A What do you want to know?

Q I want to know what tests you did. Describe them for me. How many? Let's start with that.

A I don't know. It's not something I keep track of.

Q And then describe for me what you've actually participated in directly yourself in terms of testing involving crashes or replication of crash forces.

MR. NYE: I'm going to object for a second. You keep going back and forth between testing he's involved in generally versus testing where it sounds like you're

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wondering if he's actually the test subject. So if maybe you can clarify what you're talking about?

MR. ELDER: Your objection is noted. Could you read back the question?

(Pending question read back.)

A I guess I would have to ask for clarification. Participation. I can conduct a test and I'm participating in the test. If I'm actually the one where the forces are being applied to my person or I'm the test subject?

Q Test subject.

A The test subject. Okay. I don't have a -- I'll try to remember what we've done. I know we've conducted tests, in essence a rear-end collision type test or a force that would produce rearward movement of an occupant looking at seats, seat backs, head restraints, various things like that. The other paper we noted where inverted Gz or negative Gz accelerations. I think we've done a variety of other things where we're looking at lifting and moving things that are not necessarily automotive crash-related, but they're involving forces placed upon the body, so slipping, tripping, falling, lifting, moving, pushing, pulling, things of that nature. In a general sense, that covers the majority of them. I can certainly not be remembering everything.

Q Can you give me any specifics of where you were the subject,

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the test subject, and an article was written regarding the findings of the test that you were involved in?
A I don't know -- I have not authored any articles where I myself was a test subject. I don't know what has been authored in my office by others in which I might have been a test subject, but I have not authored any articles where I myself was a test subject. Generally that's not something you would do scientifically.
Q It would be kind of unscientific to use like the author of the paper as one of the test subjects; is that what you're saying?
A It's just generally something that's not done. So generally you use somebody else, so you attempt to eliminate any bias, so you would not utilize yourself necessarily. Again it depends upon the test. But the type of work that I would have been doing I don't think would have lent itself to me being a test subject and also authoring a report.
Q And then I want to be very specific. Have you authored any articles in which you did testing on human subjects and reported the findings on the human subjects as part of your published article?
A I think it would be included in some of those articles, but it wasn't necessarily the intent of those articles to discuss what's happening to a live human test subject. Again, throughout the research phase on a variety of these

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different articles, different types of live human subject testing was performed, then that information was utilized in some form or fashion, and it's not necessarily the intent of the research, so I don't know if it would be noted specifically as here was a test conducted, here is the result of that test of a live human subject in, I guess, maybe the terms in which you were asking the question.
Q Let me ask you a few questions about your methodology. Is it fair to say that in analyzing a case like Laura Wolf's case you want to form some opinion as to the severity of the collision?
A Well, I think we note quite clearly, I guess it's on page three of my report, and this is an accepted methodology, and I think we even cite multiple references, that one of the steps is to quantify the nature of the subject incident in terms of forces, accelerations, and changes in velocity of the vehicle.
Q So is the answer to my question yes?
A I think I answered it. I was just trying to be very specific.
Q Mr. Probst, I'm just going to ask you today, I'm asking you questions, very specific questions, and I'd like answers to those. I'm paying for your time, so you may want to talk about some other stuff, but I'm going to ask that you listen to my questions and just try to answer the questions that

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I'm asking.
The first question that I asked was whether part of your analysis is to get some idea of the severity of the collision. And it sounds like the answer to that question is yes; is that correct?
A As I answered the question previously, step two of my analysis is to quantify the nature of the subject incident in terms of forces, accelerations, and changes in velocity.
Q Okay. And the methodology that you're using is that you're looking to see whether various components of the vehicle have failed in the collision; is that fair?
A Again to be specific, it's noted in my report we performed what is known as a damage threshold speed change analysis.
Q Correct. And as part of that you're looking to see whether components on the vehicle have failed?
A Not necessarily. We're looking at the difference between empirical testing of the same vehicle, similar vehicle, same make, model, same production run to our actual subject vehicle, and we're comparing the damage or the deformation or the energy required to produce those changes.
Q What you're doing is you know the fail point of certain components; isn't that fair?
A We know what occurs to a test vehicle at a given speed.
Q And so if you know that a component is going to fail at, for example, a collision involving a certain range of speeds or

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forces, and that component did not fail, then do you draw the conclusion that the collision must have involved forces or speeds that are below the threshold of failure?
A I would say yes, in a general sense I would agree with you, that we're comparing, again, empirical data from one test to actual data from our subject incident and looking to see if there's more or less structural change which would therefore indicate more or less energy application.
Q And so when you're looking at photographs and when you're looking at damage estimates, what you're really looking at is are the structures involved in the automobiles being deformed, failing, or having other types of alterations as a result of the collision?
A Potentially. Sometimes we're looking to see if there is damage or is there no damage. Again it depends upon what the incident is, what we're asked to do, how we're analyzing it.
Q So let me give you a specific example. If a bumper is rated at five miles per hour and the bumper does not have failed components, then you would generally conclude that the collision must have been five miles per hour or less?
A I wouldn't simply look as it as what the bumper is rated for.
Q So you use your words, because I tried to give you a very clear example. Let's use a very simplified thing that a

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jury could understand like a bumper and the type of -- it either fails or it doesn't fail in a collision, and the conclusions that you draw from that.

MR. NYE: Is that a question?

A It's a very generic question. Whether a bumper fails or doesn't fail, what conclusions can I draw?

Q Yeah.

A That's so open-ended. I could answer it in any manner in which I choose and that's not offering any insight into anything.

Q Fair enough. Let me ask the questions this way. Did you conclude in the context of Laura Wolf's collision that the motor vehicle collision must have occurred --

Let me take that back. I'm going to start over.

Did you conclude in the context of Laura Wolf's case that the speed change of her Subaru was five miles per hour?

A We noted that it's comparable to a five-mile-per-hour change in velocity, correct.

Q Let me ask you specifically. You added the word "comparable". What the does the word comparable mean in the specific context that you used it?

A Well, in this particular test, generally it's not exactly at five miles per hour. It's four point nine to five point-something. So at the range of five miles per hour. So it's somewhere close to five-mile-per-hour, meaning

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comparable. You have an empirical test, they weren't conducted at precisely five miles per hour, but as close as possible, and then in our incident it works out to be the same, so it's comparable.

Q So your word comparable, you just mean sort of approximately or in the range of?

A Again, just because we weren't specific in noting the exact test speed at which the empirical testing was performed, this isn't an approximation. We could note specifically at which the test speed was and say this is at above or below, but just in normal English terms we're saying it's comparable to.

Q How did you arrive at the conclusion that the speed change for Laura Wolf's Subaru was comparable to five miles per hour?

A Well, as I stated earlier, we conducted a damage threshold speed change analysis.

Q And what did you find in that regard that led you to the conclusion that the speed change for Laura Wolf's Subaru was comparable to five miles per hour?

A That the damage noted to her vehicle through photographs, repair records, and, I guess, repair invoices was comparable to that when conducted to a similar vehicle at five miles per hour.

Q And what specifically about the repair estimates or the

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photographs led you to believe that it's comparable to a five-mile-an-hour speed change for her Subaru Outback?

A Again, I think we made it fairly clear in the report that the only noted damage to the subject Subaru was to the bumper cover. And to the trailer hitch itself, that it was, in essence, pushed forward. And when you strike the rear of a Subaru at five miles per hour you sustain damage beyond the bumper cover and so you have other components that would be damaged indicating greater energy.

Q What would you have to see in terms of the property damage that is different in order to reach a conclusion that's there's greater than five-mile-an-hour speed change for Laura Wolf's Subaru?

A Basically what we noted in the report, that in the test vehicle we had damage that went beyond the bumper cover. I believe not only the bumper cover, but there was damage to the reinforcing bar itself, a structural portion of the bumper, and there was damage to that as well which didn't occur in this case.

Q And what are you referencing specifically in terms of the comparable? You're comparing Laura Wolf's vehicle damage to something else. What specifically are you comparing that to?

A Again, as we note in the report, the Insurance Institute for Highway Safety tested actually two 2000 Subaru Legacies in a

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series of five-mile-per-hour impacts.

Q And let me make sure that I understand. You're using the Insurance Institute for Highway Safety testing on Subaru Legacies. But Laura Wolf was in a Subaru Outback; correct?

A Subaru has a weird naming convention. So the Subaru Legacy is the same as the Subaru Outback. It's more of a trim level than an actual vehicle, so it's the same vehicle.

Q Do they weigh the same?

A I don't have my file. I don't know if I printed everything out from all those stats, but it would show that these vehicles weigh the same, yes.

Q So you're comparing the damage to Laura Wolf's vehicle to the Insurance Institute for Highway Safety tests that they performed at collisions involving a speed change at five miles per hour and you found that they were comparable or similar; correct?

A Correct.

Q Did the Subaru Legacies used in the Insurance Institute for Highway Safety crash tests have tow hitches installed?

A They did not.

Q Is it significant that Ms. Wolf's Subaru Outback had a tow hitch that was involved in this collision?

A Not as part of my analysis, no.

Q And why not?

A Basically it doesn't affect the manner in which I performed

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the analyses. The tow hitch is of less significance structurally than the reinforcing bar. And again there was no damage beyond the instance of the bumper cover on this vehicle. So again it still shows a comparable energy between a test vehicle and the subject vehicle.

Q And do you believe that it's fair to compare a collision involving a tow hitch where the tow hitch is hit to collisions done by the Insurance Institute for Highway Safety involving vehicles that do not include tow hitches in their collision?

A Certainly it is.

MR. MAXWELL: Sam, can we take a break?

MR. ELDER: We'll take a break in a few minutes.

Q What kind of tow hitch did Laura Wolf have on her Subaru Outback? Was it a factory installed tow hitch or was it an after-market tow hitch?

A That I don't know. That wasn't part of my analysis, so it didn't -- it wouldn't affect my opinions if it was factory or after-market.

Q What's the towing capacity of a Subaru Outback tow hitch?

A Again, I didn't look that up, so I don't know. It, again, wasn't part of the manner in which I performed my analyses.

Q Are you familiar with the process of testing that's necessary to get a tow hitch approved for use on automobiles in the United States?

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A Not intimately, no, I would say I don't know that as I sit here today.

Q Isn't it true that in order to be approved, a vehicle tow hitch has to be able to carry its maximum load and be able to perform an emergency stop without any deformation of the tow hitch?

A Again, as I said, as I sit here today I don't know all the specifics, so I can't say whether that's correct or incorrect.

Q Prior to the collision, what was the distance between the tow hitch ball and the bumper on Laura Wolf's Subaru Outback?

A That I don't know. Again, it wasn't part of the manner in which I performed my analyses, so it didn't matter, so I didn't seek to find that information.

Q During the subject collision did the tow hitch ball on Laura Wolf's Subaru Outback get compressed in to where it was all the way up against her bumper?

A Well, not just the ball, but more the whole hitch assembly moved forward, and it appears there's contact between the ball and the rear bumper cover.

Q And, in fact, the ball went from a position behind the bumper, it got compressed, and it actually deformed the bumper itself; isn't it true?

A I assuming that all this occurred in the event. I'm giving

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the benefit of the doubt to Ms. Wolf that prior to this incident the ball hitch was in some different location and that some deformation did, in fact, occur.

Q How much force does it take to take a tow hitch on a Subaru Outback and compress it in from its normal position to where it's up against the bumper?

A I haven't tested any and all Subaru Outbacks and all tow hitches, but looking at this specific case it's about a five-mile-per-hour change in velocity.

Q How do you know that?

A Again, we know quite clearly -- we can compare testing from empirical testing where it's focalized loading to the rear of a vehicle, which is what would occur when you contact a tow hitch, so you are comparing apples to apples, focalized loading to a test vehicle to focalized loading of the subject vehicle, and you note that it's comparable damage. Therefore, that tells us what it takes in this specific case with this specific vehicle to move a tow hitch, assuming it was not in contact with the rear bumper cover, forward such that it's now in contact with the rear bumper cover.

Q Have you seen any specific tests done on Subaru Legacy tow hitches that look at how much force of a collision is necessary to take the tow hitch from its original position to compress up against the bumper?

A I have not seen any tests specifically like that, but you

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don't have to look at a test specifically like that to analyze that or to form an opinion regarding that.

Q Now let's take it out of the context of a Subaru Legacy. Have you seen any tests on any model of vehicle with any type of tow hitch that shows how much force of a collision it takes to take the tow hitch from its original position and compress it up against the bumper?

A I don't recall seeing those. It doesn't mean that that type of research hasn't been performed. I simply don't know of anything off the top of my head.

Q Let me ask you this. Exhibit Number 2, your report, contains 60 different footnotes and references to various scholarly articles. Do any of those citations reference testing that was done on tow hitches?

A Again, I don't know every detail on every one of those 60 articles as I sit here today, but I don't recall any specific mention of rear impacts to tow hitches.

Q Do any of the 60 articles that you cited contain studies on how much force or how severe of an impact does it take in order to compress a tow hitch from its original position to up against the bumper of a vehicle?

A Again, I do not recall and I don't believe that any of those address that specific thing.

Q Now let me ask you: Are there articles that you have not cited that specifically look at the issue of tow hitch

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collisions, either in terms of the severity of the injuries that arise from them or in terms of the forces that are necessary to compress the tow hitch?

A Again, as I stated, I'm not aware of articles, scholarly articles discussing the amount of force necessary to compress a tow hitch. So certainly if I'm unaware of them, it's not something I would or would not exclude from the report.

Q Let me ask you this. Did you make any attempt to research and find out whether there are any published articles, published statistics showing how much force or how severe of a collision it takes to compress a tow hitch into the bumper?

A Again, the manner in which I perform my analyses, it wasn't necessary to perform that, so there was no need to research any scholarly articles looking at the amount of force required to compress a tow hitch.

Q Let me ask you again because you said that it wasn't necessary. My question was only: Did you do it? Did you research whether there are any published studies, statistics that show how much force or how severe of a collision it takes to press a tow hitch into a bumper in a collision?

A Again, as I stated, it wasn't the manner in which I performed the analyses, so there would be no need to search for scholarly articles on something that I'm not actually

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working on, so that would be just a waste of my time, effort, and somebody else's money, so that's not something I would have done.

Q And then let me ask you. Did you research any articles that are published about injuries resulting from collisions involving tow hitches?

A Again, the same thing. It's not the manner in which the methodology was performed, so there was no need to look up any articles regarding injury potential in tow hitch impacts.

Q Did you reach your conclusion that the speed change for Laura Wolf's vehicle was five miles per hour based on the fact that the bumper did not sustain more damage?

A That's not what I've stated earlier. Again, it's quite clear in my report. I was trying to be quite clear in my answers previously in the manner in which we analyzed this

Q I still don't think that you've answered the question, so I'll try it again.

Is the reason that you reached the conclusion that Laura Wolf's, the speed change of her vehicle is five miles per hour, is because there was not more damage done to the bumper?

A Again, to be more specific I could read from my report and probably read back a previous answer, but what we did was perform a damage threshold speed change analysis comparing

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focalized loading to a 2002 Subaru, compared the damage deformation, structures, whatever way you want to put it, to the test vehicle to the subject Wolf vehicle. That's what was performed.

Q And the only comparison that you did was the comparing of the severity of the damage to her vehicle with the severity of the damage reported by the Insurance Institute for Highway Safety crash tests on a Subaru Legacy involving no tow hitch?

A As far as the damage threshold speed change analysis, we did utilize the test of the 2000 Subaru Legacy in comparison to the Wolf vehicle.

Q So the answer is yes, for the speed change all that you looked at was a comparison of the damage of her vehicle to the comparison of the Insurance Institute for Highway Safety tests on a Subaru Legacy without a tow hitch?

A That's not what I stated. What I stated was as far as the damage threshold speed change analysis.

Q Okay. The damage threshold speed change analysis, that's where you came up with the fact that Ms. Wolf's vehicle speed change was five miles per hour?

A That's one means.

Q What's the other means? Other than the Subaru Legacy testing done by the Insurance Institute for Highway Safety, tell me the other ones.

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A Well, just from my experience and background, I've conducted hundreds of energy-based crush analysis, either programs such as EDCRASH or PC-Crash, and vehicles such as the Hyundai or the Subaru in a ten-mile-per-hour collision is going to exhibit multiple inches of crush, and when you focalize the loading you're going to have even more significant crush, and that tells us it's well below a ten-mile-per-hour rear-end collision, and that tells us that five-mile-per-hour is a valid analysis.

Q You referenced a couple of different computer programs; correct?

A Correct.

Q Did you use either of those computer programs in your analysis of Laura Wolf's case and your preparation of the report in her case?

A Specifically, no. As I stated, I've conducted, I don't know how many numerous analyses, and in no case at ten miles per hour has there been crush comparable to what is noted in the photographs and the repair estimates to either of these vehicles.

MR. ELDER: Let's take a break for a couple of minutes.

(Recessed 10:58 a.m. to 11:03 a.m.)

Q Mr. Probst, I prepared a little chart that's blank that shows sort of a graph of acceleration and time. I was

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wondering for this type of collision can you draw for me the approximate sort of shape of the acceleration curves that occurs with a collision like this?

A I don't claim to be an artist, but what you're going to have is something in the shape of a haversine or half sine wave, basically kind of like a bell curve.

Q And as I understand it, you use a duration of collision of .15 seconds or a 150 milliseconds; is that correct?

A In this particular case we did.

Q So could you show me to this graph with a line that you just drew, where would the 150 milliseconds be?

A It would start at the beginning of the graph and time would end basically at this point at 150 milliseconds.

Q And the acceleration when it goes up, that means it's basically a positive acceleration; correct?

A Correct.

Q Is there a portion of the curve that goes sort of below the line and becomes negative acceleration in a collision like this?

A It depends on what the other vehicle is doing. Obviously at some point it decelerates and can just roll to a stop and go to zero. If the brakes are applied, or something like that, certainly you have a negative acceleration, or if it contacts another vehicle, some other object, it's certainly possible to have some negative acceleration.

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Q So, in other words, down the towards the 150 millisecond end of the graph the line may actually go negative?

A Again depending upon what event you're discussing. It could go back up, it could go back down, it could just stay at zero. Very opened-ended question.

Q Can you draw a horizontal dashed line that represents sort of the average acceleration for this acceleration curve.

Okay. And then, I guess, the last piece of art that I'm going to ask of you is if you could draw on the bottom chart sort of the velocity versus time. Could you draw the approximate shape of that curve if you plotted it out?

A It's a nonlinear curve. And so what happens is you have an increase in velocity, and then as the velocity or the acceleration decreases it becomes more asymptotic. So I guess the easiest way to say it is it's asymptotic from below approach from the velocity of zero up to our max change in velocity.

Q Let me further clarify that you calculated in the context of this collision involving Laura Wolf and her Subaru Outback that based on a five-mile-per-hour speed change that the average acceleration was 1.5g's; is that correct?

A I'm just seeing it now and looking at it now that we do have a typo on page five. Let me just re-read this.

At a bottom of page five in the paragraph beginning with Review, we note that using an accelerate pulse with a

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haversine, an impact duration of 150 milliseconds, the average acceleration associated with a five-mile-per-hour impact is 1.5g's.

I guess I can clarify the next sentence. It appears we're saying there's peak acceleration, but it should be that the most acceleration that would be experienced by Ms. Wolf is that 1.5g's, not necessarily meaning the difference between a peak and an average acceleration. So in this particular case, yes, we determined an average acceleration.

Q So the dotted line that you drew for Laura Wolf's collision is at 1.5g's; is that correct?

A Correct.

Q And could you write on there 1.5g's then?

And when you're talking about 1.5g's, you're talking about the Subaru Outback; correct?

A Correct.

Q You're not talking about Laura Wolf particularly. You're talking about the vehicle, not the occupant; correct?

A Well, as you're noting, that's the maximum the vehicle can experience. Therefore, even if all the energy that the vehicle has experienced has been transferred to Ms. Wolf, which is theoretically impossible, we would say the maximum she can receive would be 1.5g's. However, obviously, some of that energy or acceleration is lost as it travels through the vehicle, if you will. Various portions of the vehicle

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absorb some of the impact or the energy and some is converted to sound, heat, various things like that. So again, the maximum would be 1.5g's if everything was capable of going from the vehicle to Ms. Wolf.

Q Let me ask you a couple more clarifying questions because I want to break this down.

You found that the average acceleration of the Subaru Outback was 1.5g's over the 150 milliseconds; correct?

A Correct.

Q What happens is if you apply a constant acceleration of 1.5g's to an object over 150 milliseconds, at the conclusion of that 150 milliseconds the object is going five miles per hour?

A If you have a crush pulse in the shape of a haversine and the average acceleration of that haversine is 1.5g's and the pulse lasts a duration of 150 milliseconds, then yes, you have a five-mile-per-hour change in velocity.

Q So on the little graph that you drew on the bottom, the end point of the velocity after 150 milliseconds, that ends up at five miles per hour; correct?

A Correct.

Q Could you write that on there?

Did you make any attempt to determine the peak acceleration level that Ms. Wolf's Subaru Outback experienced in this collision?

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A Just as part of the spreadsheet it reports the, I think, peak and average, and then for other shapes if we're looking at a different type of event as well.
Q Did you make an attempt to determine what the peak acceleration level of the Subaru Outback was?
A As I said, it was determined, yes.
Q And what is it?
A I believe in this particular case it should have been 3.0g.
Q Could you write on there 3.0g?
Now, I've read through your report. You didn't mention 3.0g anyplace in this, did you?
A I don't know. I'd have to go through it word by word, but I don't recall that I did.
Q And, in fact, isn't your report wrong when it says the peak acceleration experienced by the Subaru in which Ms. Wolf was seated was comparable to 1.5g's?
A I think I just clarified that, that the maximum average acceleration -- so we didn't quite write it as clearly as possible in English. English is not my field of study. Engineering is. So we quite clearly note prior to that that the average acceleration was 1.5g. And then as I stated previously, because we're trying to give the benefit of doubt to Ms. Wolf that all the damage that, in fact, is noted to her car did come from this event, the maximum acceleration in terms of average acceleration that would be

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experienced by her vehicle is 1.5g. As you can see, that's a very lengthy and wordy and awkward sentence, and therefore we wrote it in a much more simplistic fashion, but obviously it confused you.
Q Thanks for clarifying my confusion on this. Let's be clear. There's a difference between average and peak; isn't that true?
A Certainly.
Q Yeah. Average is when you take the mean of all of the values and figure out that's how you get to the average; correct?
A You take the numbers, add them up, divide by the number of points, yeah.
Q And on this, we'll get this marked as Exhibit 3, it's the dotted line that's the average acceleration?
A Correct.
Q Peak has a very specific meaning in physics. And when you're talking about a peak acceleration, that's talking about the 3.0g's, the top of the curve; correct?
A If you take just the word peak and average without any other context, certainly one means summing up numbers and the other one is a maximum. However, this work peak was not used without any other context. It was used with context and it's, as I note it right before, we quite clearly note it's the average acceleration, and I clarified for you what

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we mean by that.
Q The peak acceleration that Ms. Wolf's Subaru Outback experienced, you calculated at 3.0g's; correct?
A If we're looking at the difference between an average and a peak. In the context of this sentence, this is the maximum average acceleration that she would have noted.
Q How did you calculate that the peak acceleration of the Subaru Outback was 3.0g's?
A Again, utilizing an Excel spreadsheet, looking at a haversine wave shape and a crash pulse of 150 milliseconds.
Q Did you bring that Excel spreadsheet with you?
A I did.
Q You did?
A I did.
Q Wonderful. I assume it's in there.
(Exhibit 3 marked for identification.)
Q Let me ask you about one of your conclusions that you make. You make the conclusion that the acceleration experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during various daily activities; is that correct?
A That's correct.
Q Is that really two different opinions? One is that it's within the limits of human tolerance, and the second one is that it's within the types of accelerations that Ms. Wolf

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experiences in her activities of daily living?
A Again I apologize. English was not my field of study. But what I'm simply trying to say is that the accelerations were comparable to that of daily activities, and certainly those are within the limits of human tolerance. So it's simply one opinion that these are within the -- comparable to that experienced by daily activities. But again to be more specific, noting that, yes, daily activities are within the limits of human tolerance.
Q And is that a conclusion based on the fact that you found that the average acceleration for the Subaru Outback was 1.5g's?
A Either the 1.5g acceleration -- I think we note, and there's several references in my report where we note various test subjects experienced peak and average accelerations that were in excess of this amount of acceleration here, and then it's certainly well noted in the references that we've cited.
Q So is your conclusion that the acceleration experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during various daily activities based on the fact that you found the Subaru Outback average acceleration was 1.5g's?
A It's not as simplistic as you're making it sound. We don't just say 1.5g's, therefore it is what it is. We actually do

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connect all the dots. And so if you read the report, we note that here is the acceleration experienced in this vehicle, here is all the research that has been performed showing other impacts and other events at above that acceleration as well, and then we also look at Ms. Wolf herself, various activities she's performed, noting what the accelerations are. And then based upon her reported activities, research of others, known human tolerances, we can make this comparison and show that, yes, 1.5g's is well within the limits of human tolerance.

Q So is the answer to my question yes or no?

A I was just being specific. You left out quite a few steps in the manner in which I performed this analysis. I don't just say 1.5g's, therefore this is my opinion. So again, if you read through the entire report, we go through all these various steps and citations and references to show how we go from 1.5g's to that opinion.

Q So was the answer to the question yes or no?

A The answer is what I've answered. I can't be any more specific. Again, I'd have to read the entire report to show you here is everything we did and all the steps we did. We don't just go from A to Z. We go from A to B to C to D and go through step by step by step.

Q Let's try and break this into little tiny bite-sized pieces. Your conclusion includes the phrase, The acceleration

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experienced by Ms. Wolf. Is that the 1.5g's that you're talking about or is it something else?

A Again, if you back up, I think it's purely clearly noted in conclusion number two that we've determined what the acceleration on the vehicle was, and the maximum average acceleration experienced by the Subaru Outback was 1.5g. Ms. Wolf was seated inside that vehicle. As I stated earlier, the vehicle was experiencing 1.5g. A theoretical maximum transfer of energy from the vehicle to her would be 1.5g's. However, there is energy lost. So again, being generous, giving the benefit of the doubt to Ms. Wolf saying all this energy from the vehicle is transferred to her, the maximum would be 1.5g.

So in conclusion number three it's quite obvious that we're building upon conclusion number two, that the acceleration experienced by the vehicle was 1.5g. The maximum that could possibly be transferred to her would also be 1.5g. We cannot create energy.

Q Let me be very specific. If you put an accelerometer at her temple and measured the lateral acceleration of her head, are you saying that the maximum possible head acceleration that she could experience when the vehicle experiences an acceleration of 1.5g's is 1.5?

A Due to inertial loading, correct, yes.

Q And you've never seen any study that finds that head

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accelerations of the occupant exceed the vehicle acceleration?

A Not inertial loading to the head, not inertial accelerations to the head, no.

Q I'm going to eliminate all the qualifiers. If you have peak vehicle acceleration of 1.5g's, can you have a peak acceleration of the occupant's head greater than 1.5g's or does that violate the laws of physics?

A You're looking at two different things. You're looking at inertial forces and contact forces. In this particular case we're not dealing with direct impact injuries. So certainly even if I just slap the table, I can have very high accelerations, but it's of no consequence. So what we're actually looking at is the actual pertinent accelerations, not only to the vehicle, but to the occupant. And in this particular case the maximum acceleration that is of concern cannot be of any value higher than 1.5g's.

MR. ELDER: Can we have the last question read back?

(Pending question read back.)

Q What's your answer to that question?

A I've answered that question. I could ask the court reporter to read it back. My previous response is long.

Q You qualified this, sir, with a bunch of different things like the ones that we're concerned about. I'm not asking

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about that. I'm just asking if you put an accelerometer on Laura Wolf's head and the vehicle experiences a peak acceleration of 1.5g's, can she have head acceleration of greater than 1.5g's or not?

A It's possible she has the exact same, less, or more. The maximum inertial, again, what we're looking at is what is of any interest in this incident would be a maximum of 1.5g's.

Q What do you mean by inertial acceleration?

A Non-contact acceleration.

Q What about contact acceleration then, can that be greater than 1.5g's?

A Certainly. As I explained in my previous answer I can contact this table lightly with my hand and have multiple g's, but there's no contact-related injuries or biomechanical failures in this incident, so why anybody would look at contact accelerations, there's no reason to do that.

Q Let me ask you a different question now. I'm looking at conclusions number two and number three on pages 12 and 13 of your report, and in number two you say, The severity of the subject incident was consistent with the Delta-V comparable to five miles per hour with an average acceleration comparable to 1.5g for the subject 2000 Subaru Outback in which Ms. Wolf was seated.

Conclusion number three you state, The acceleration

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experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during various daily activities.

My question for you is: How much higher would the 1.5g's in conclusion number two have to be before you would no longer feel comfortable writing in your report conclusion number three that you reached?

A I think there's a significant disconnect between engineering, law, and what we're dealing with here. If we were dealing with a direct contact failure, then we'd be concerned about direct -- or accelerations associated with direct contact. There's nothing in any of the records to suggest there's any direct contact failure associated with this event to any part of her body. So to obtain that value, to look at that value, utilize that value in any fashion is meaningless.

It's certainly possible to make a determination of what that is, but there's no purpose in doing that because, again, there was no failures associated with direct contact accelerations.

Q Let me try again because I'm going to ask this question all day long until we get an answer, okay?

You found 1.5g's of average acceleration of this vehicle. You're writing this report and you're either going to write for conclusion number three that the acceleration

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experienced is within the limits of human tolerance and comparable to that experienced during daily activities or you're going to write that it's not within the limits of human tolerance and comparable to those experienced in daily activities.

At 1.5g's you write that it's within. What would that 1.5 have to change to before you would no longer issue opinion number three and you would change opinion number three to read the acceleration that she experienced was not within limits of human tolerance? What do you have to change? What do you change it to before you don't reach conclusion three?

MR. NYE: Object to the form.

A Again, unfortunately there's a disconnect between engineering and my background and your -- you have an incomplete predicate. You're just simply saying, What has to change? What has occurred to her? And once I know what's occurred to her, then I can tell you what the force must be. You're simply saying, What changes? That's incomplete. You haven't asked anything -- you haven't provided me enough information.

Q I'm going to run through a series of examples and you tell me. If you changed your calculations so that you arrived at an average acceleration of 2.5g's for the subject 2000 Subaru Outback, would you still write conclusion number

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three, that the acceleration is within the limits of human tolerance and comparable to those experienced with various daily activities?

A You basically just reasked the same question. I apologize. My report goes through quite clearly what it takes to receive the failures she experienced, that these would be resulting from inertial loading, not direct contact forces. And are you asking -- are we still dealing with inertial forces, direct contact forces, different injuries, same injuries? You haven't provided any information. You've only changed the acceleration, but what else is changing? Because you're saying what's now changing, but you have to provide information. I don't know what you're asking. You have to be specific.

Q Well, I'm being super specific. You authored these reports, sir, and I want to know -- okay, let's break it down in a series of steps. First of all, isn't it true that your conclusion number two and conclusion number three are related?

A Certainly. The whole report is related to everything in the report.

Q So you're taking what you calculate in terms of the acceleration of the vehicle and you're applying it to determine whether or not the forces are within those of human tolerance and daily activities or not; right?

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A As we stated earlier, there's all the steps in between, and what we reached as a conclusion that 1.5g's is well, in fact, within the limits of human tolerance, and well within the limits of Ms. Wolf's personal tolerance.

Again you're taking something out of context if you're now trying to say it's something that's inertial loading and a direct contact force. Two different things.

I apologize if you are not familiar with biomechanics. I am. I understand that your question is incomplete. Whether you realize it or not, it's simply incomplete and cannot be answered in the fashion in which you asked it.

Q Let me ask you this. I'm going to read you your sentence: The acceleration experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during daily activities.

What would it take for you to write the opposite of that in a report?

A This is the part where there's the disconnect. What else has changed? Because we could have high accelerations and still not see certain types of injuries. Again there's an endless possibility of what might or might not happen at a variety of accelerations with a variety of outcomes. I don't know what you're saying. If we increase the acceleration at some point, if we apply enough acceleration to this vehicle, you're going to crush it such that you now

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are invading the occupant space and part of the vehicle is contacting her. That's vastly different than what we have here. You haven't specified what is or is not occurring.

Q Let me ask you this. Have you ever written a report where you found that the acceleration experienced by the occupant was not within the limits of human tolerance and comparable to those experienced during various daily activities?

A I certainly would believe so. I'm not sure if we noted it in that same terms, but I've certainly authored reports where we said a person was injured either in an automotive accident or some other event.

Q Are you making some comparison in reaching your conclusion that the experience -- that the acceleration experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during daily activities? Are you making a comparison, sir?

A Certainly for validation purposes throughout the report we note that here are a quite number of studies where they look at an input acceleration to a vehicle and note that this -- a variety of people, a variety of ages, both male, female, with pre-existing conditions, various things like that have withstood this event. So from an automotive point of view it's within limits of human tolerance. There's other references, I believe, in here that talk about just overall body accelerations, it also notes that that is well within

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the limits of human tolerance. And then we note other tasks that Ms. Wolf could perform without injury and we can determine those accelerations and say that this is within her personal tolerance level.

Q Aren't you comparing the acceleration that she experienced in this collision with what you believe to be the limits of human tolerance and her activities of daily living? You're comparing those two things?

A We're noting that here is an input acceleration, others have studied this, it's well within the limits of human tolerance. If you want to say it's a comparison -- we are looking at the difference between an applied force and a resultant. But it's not just the acceleration. Again, we're looking at what is occurring to this occupant, their movement, their restraint capabilities, various things like that, as well as what does occur to individual anatomic regions as these forces are applied.

Q Are you comparing 1.5g's to something else in reaching conclusion number three? Are you saying whether 1.5g's is less than some other number?

MR. NYE: Object to the form.

A Well, certainly we note that at some points, yes. I mean, math being what it is, 1.5g's is less than some of the other numbers we mention, like 17g's. We can't avoid that. There has to be some comparison. Math is math. So 1.5 is, yes,

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in fact, less than 17.

Q Did you mention 17g's somewhere? Did you make that comparison in authoring your report?

A Page eight.

Q Are you, in fact, making a comparison between the 1.5g's that you calculated Ms. Wolf's Subaru experienced and 17g's in reaching your conclusion number three?

A Again, if you would like to call it a comparison, you are welcome to. But we're quite clear in the report what we've done is determine the acceleration and various things that you haven't bothered to discuss yet, but when we look at 1.5g's and we look at the published literature as to input, response, and outcome of the various events, that there are other events of greater magnitude in which no biomechanical failures have occurred.

Q If Ms. Wolf had 18g's of acceleration in this collision, would you have still written that the acceleration experienced by Ms. Wolf was within limits of human tolerance and comparable to that experienced during various daily activities?

A I doubt I would say it's comparable to various daily activities. But depending upon, again, a specific set of circumstances for various portions of her body, that still could be well within the limits of human tolerance, 17g's.

Q What about 25g's?

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A What about 25g's?

Q I just used the example of if she had accelerations of 18. What if you changed that question to 25g's? Would you still be writing conclusion number three?

A Again, it depends on what information is provided, how we analyze it. But, again, some of these various citations, I don't think we note it in the report, but various portions of the body can well withstand input accelerations in excess of 40g's. It depends upon what you're asking, what kind of -- what portion of her body, how she's restrained, what the actual test case scenarios are to actually be able to fully answer that question. Simply giving an acceleration doesn't cover any other variable. You're simply looking at one variable.

Q No, I understand. Okay. So if the acceleration experienced by Ms. Wolf was 41g's, would you be comfortable writing your conclusion number three, quote, The acceleration experienced by Ms. Wolf was within the limits of human tolerance and comparable to that experienced during various daily activities?

A At that point, 40g's, because it's again body-part-dependent, actual event-scenario-dependent, it's possible at that point, yes, now we're starting to get into the range where we're exceeding various tolerances and various body parts and different orientations, different

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applied vectors. Without knowing any of that information, I can't say, but, yeah, certainly we're getting into that realm where many things can occur.

Q That's where you would start to become uncomfortable with writing conclusion number three?

A Again your question, sir, is grossly incomplete because, as I stated before, once you're getting up to accelerations such as that, depending upon the type of vehicle as it's applied to the vehicle, now we have a completely different scenario because we can have intrusion into the vehicle where objects of the vehicle are contacting her, the seat could collapse, you have an unrestrained occupant, a variety of other things could be occurring to drastically change that. We might not get to 40g's before all those things occur. So without actually analyzing that and having a complete set of data or a complete -- formulate a question from you, I can't say. But I can certainly say that yes, now we're starting to get to the level where we're at or beyond tolerance levels for various body parts, various orientations, and various scenarios.

Q Let me ask you this. The duration of the collision that you used, 150 milliseconds, is that a relatively standard time duration to be using for rear-end collisions?

A It's actually a little bit low based upon the published literature and testing that I've performed. I've seen crash

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pulses up to roughly 400 milliseconds. But again, to give Ms. Wolf the benefit of the doubt to make it the most severe event possible, I chose 150 milliseconds.

Q Have you seen any published reports that talk about crash impulses down in the range of like .09 to .124 seconds per the crash pulse?

A Generally for a higher speed events. When we're talking something more comparable to what you would see in a FMVSS testing, 25 plus miles per hour, I've certainly seen that noted.

Q Let me ask you this. As the speed increases, like the speed at which the bullet vehicle hits the target vehicle, as it increases, do you have to adjust the duration of the collision? So, for example, in this case for a five-mile-an-hour speed change you used a duration of 150 milliseconds or .15 seconds. If you increased that to, say, like 30-miles-an-hour speed change, would you have to adjust the duration of collision?

A Again, depending upon the type of 30-mile-per-hour collision, I would generally use something probably in the 70 to 120 millisecond range for a higher speed event, so yes, there is some adjustment. But a 5 and a 30 are vastly different events. The energy's related to the square of the velocity. So if you squared 5 and squared 30, you can see it's orders of magnitude different in energy where you now

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make a change in the pulse duration.

Q And just so that I'm clear, at a five-mile-an-hour speed change you're going 150 milliseconds. If you increase that speed change, then you're going to decrease the duration of the collision?

A Again, potentially, based upon the type of event, type of collision, and how much greater the actual impact speed is.

Q Have you ever tried to calculate what kind of speed change would be necessary, speed change of a vehicle would be necessary to generate a peak acceleration --

Let me start all that over.

Have you ever tried to calculate what kind of speed change would be necessary to create an average vehicle acceleration of 40g's?

A I don't think I've sat down and just said if I have a 40g impact what type of Delta-V are we looking at. I don't think I've -- I don't believe I would have performed that analysis, no.

Q Because I sat down and did it, and for 150 millisecond duration collision it would take 132 miles an hour of speed change to get a 40g average acceleration. Does that seem right to you?

A I don't know. As I said, I haven't performed that analysis, so I can't say. Again, unfortunately automotive events are highly nonlinear, and so as damage is occurring, various

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other things are occurring. So once you get up into higher speeds, again because it's nonlinear, we're not having that same stiffness coefficient, and so things can change to affect that calculation.

Q To generate 40g's of acceleration, if you're starting at zero and the duration of the collision is 150 milliseconds, at 40g's at the end of 150 milliseconds you'd be going 132 miles an hour. Do you have any reason to disagree with that?

A I haven't run any of those numbers and I don't have your calculation, so I can't say one or the other.

(Discussion off the record.)

Q So, Mr. Probst, I did a Google search on acceleration calculator and I got a website that has flexible units and I put in there that a starting speed of zero and an ending speed of 132 miles per hour and a duration of .15 seconds, and that produces g force of about 40g's; correct?

A That's what this website says, correct.

Q And do you have any reason to disagree that this website -- does that seem wrong to you?

A Again, math being what it is, it's most likely correct, yes.

Q Let me ask you. You cited to a number of different articles in your report about crash tests involving human subjects; isn't that true?

A Correct.

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Q And the point of these studies is to try and understand motor vehicle collisions better?
A Various ones are looking at various aspects. Some of them are looking at the role of head restraints, some of them are looking at the role of the seat as your primary means of restraint. They're looking at a variety of different things.
Q And they're generally trying to understand the forces involved in vehicle collisions?
A Again, some are, some aren't. They're all looking at different things.
Q They're generally trying to understand the bodily movements of occupants during motor vehicle collisions?
A Again, certainly in some, yes, they are, in other ones it's just a by-product of the testing that's being performed.
Q And ultimately this is all being done to hopefully design safer vehicles and keep occupants safe; isn't that true?
A Well, that's ultimately one goal of biomechanics. If we know what's occurring, we know how to mitigate or prevent various things. So certainly this information could be utilized in designing better and safer cars.
Q And the point of doing crash tests on human beings is not to torture test them to see what levels of forces will injure people?
A Well, certainly you don't want to create an injury during

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testing, no.
Q And, in fact, the studies' principals, the designers of the studies, they try to predict human safety and not purposefully cause injury to people?
A Correct.
Q And they control the speeds involved in human crash tests so that they can get data that's useful to them, but hopefully not injure the people that are participating?
A Well, you could look at it a different way that we've known for quite an extremely long amount of time the tolerance of the human body, and so we can apply that knowledge and generate a test or protocol that we know is well within human tolerance, and so we're not really doing anything new or unique by picking various speeds of the input velocities for these tests.
Q So before doing tests, generally the principals control the speeds to levels that they believe are not going to hurt the people that are participating?
A Control the speeds, acceleration, force. Depending on what's being tested, how the test is being performed.
Q And they also try to control the environment the best that they can to mimic real world conditions of motor vehicle collisions.
A Again, it depends on what they're looking at. Sometimes they want the occupant in position, other times out of

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position, sometimes with a head restraint, sometimes without a head restraint. They look at a large range of various aspects of motor vehicle scenarios.
Q Isn't it true that one of the standard techniques that they use is that they generally put blinders on people and then they put headphones with loud music on there so people can't tell exactly when the collision's going to occur to try to mask the visual and auditory cues that would cause a test subject to anticipate the collision and tense up?
A Certainly they've conducted tests like that. I don't know if you would say that's a standard for all live human testing because sometimes they do want to know the effect of awareness of an impending impact. Other times they could certainly change the manner in which they perceive things. Other times, I don't think we cite it in here, but they've generated placebo rear-end collisions where there's in actuality no contact between the two vehicles, but they allow the occupant to be aware of it. So they look at, again, anything and everything, and they've researched this quite extensively.
Q Let me ask you about that one because I'm curious. You're suggesting that there's published articles on crash tests where there's placebos where there is no collision, they just sit in the car and there's no collision that's reported scientifically?

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A Correct.
Q Can you give me an example of a specific article where there's tests involving no collision?
A There is a test by a gentleman named Castro, and it's actually -- no, we have him cited for a separate article. But there is one that he authored where actually in the title of it is Placebo Rear-End Collisions.
Q Now, my understanding is that you cited to a number of different studies involving crash tests on human subjects that involve similar speed changes and similar accelerations to those that you calculated for Laura Wolf and her vehicle; isn't that true?
A Some are significantly higher input of velocities and some are comparable and there might be some that are below. We cite a range of input velocities.
Q And the general purpose or idea is that you're looking at various crash tests involving human subjects and using those as comparables for Laura Wolf's collision?
A No. Obviously, you've not understood what I did in my report.
Q Let me ask you this. What's the purpose of citing to various tests involving human subjects?
A Well, what I've done is I've utilized the scientific methodology to propose a hypothesis, to test that hypothesis, and then in the validation phase to validate my

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results I cite various literature. Generally what we're discussing at this point in time, the various crash testing with life human subjects, that's validating my own independent analyses. So you can call it a comparison, but, in fact, it's an actual validation of a separate analysis.

Q And in that validation process you're trying to cite to human test subjects that have similar ranges of speed changes and accelerations to those that Ms. Wolf and her vehicle would have experienced; isn't that true?

A Again, there's some that, I think, are less and certainly some that are more. This is just a reasonable cross-section of articles that are available. There are certainly quite a number more that we could utilize.

Q Are there some tests that have been done and articles published about those tests where people were involved in collisions with similar levels of speed change and similar accelerations to those experienced by Ms. Wolf and her vehicle where people did not report any symptoms?

A Let me see if I understand your question. Are you saying are there tests performed of comparable force as the one we're discussing today where people have not reported injuries?

Q Correct.

A Certainly.

Q And identify for me, because I think you've got 60 different

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references in your report, which ones are you talking about in that regard?

I might be able to help you out. I think that there's a reference on page -- I think it's on page 11 of your report where there's sort of a string citation of various human tests, like 50 through 54. I don't know if that helps you but --

A I'm just going through these from the beginning. I believe Siegmund, number two reference, I believe that has some mention. Four and five, certainly they might not be discussing automotive events, but they're discussing forces and tolerance levels in humans.

Q I'm going to stop you just because I want to be very specific in my question. I'm not talking about general articles that are just talking about forces and tolerance levels and stuff like that. I'm talking about something very, very specific here. I'm talking about articles that are written about crash tests done on human subjects that are designed to replicate motor vehicle collisions. And I'm not talking about a literature review or something. I'm talking about the report of the testing that was done, specific testing that was done on human subjects. So limit your response to just those ones.

A Without going through each article to see if it matches your criteria specifically, this is my best guess, that also

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number 18, Agaram. Number 21 is not a staged collision, but they are looking at collisions and the outcome of those collisions on human subjects.

Q So those aren't tests, that's a field study, so that wouldn't respond to my question; correct?

A Again, it depends upon how you are defining what a test is. In the scientific method you can propose a hypothesis and test it in a variety of manners, so this could be a test --

Q I'm going to clarify this. I'm not talking about where people were involved in real world collisions outside of a laboratory and then someone went and collected data and wrote an article on it later. I'm talking about crash tests that are done as an investigation to determine the human response to crash tests.

A So I don't recall if 23 had live human subjects, 24 and 25 are obviously looking at tolerance levels in rear-end collisions, number 26 by West, I don't recall these other papers by Castro just because I have the placebo in my mind now. I don't know if Ito would meet your criteria because it's a simulated whiplash.

Q That's right. That's using dummies.

A I don't remember if that one's dummies or ligamentous spines.

Q It's dummies.

A Vijayakumar, number 31, Szabo number 35. Weiss has a number

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of things where they're applied accelerations, it's not actually crash testing, but it's applied acceleration. Number 40 doesn't apply because we're not looking at crash loading, but we're looking at loading from other means, we're also looking at loading applied to the body and the outcome. I don't recall 41, but it's possible by Gates. Nielsen, number 51, I believe. I think 53 Braun. I don't believe number 60, Rudny, has live subjects.

I believe that's what generally meets your criteria.

Q Let me ask you. In those various crash tests, is it your testimony that they demonstrate that people can be involved in collisions at speed changes and accelerations similar to what Ms. Wolf and her vehicle experienced and sustain no symptoms as a result?

A That's not what I've stated, no.

Q I didn't ask about what you stated. I just asked you a question.

Is it your position that there's various scholarly articles that demonstrate that in laboratory tests involving motor vehicle collisions with similar speed changes and similar accelerations that the subjects can experience those and sustain no symptoms?

MR. NYE: Objection; asked and answered.

A I think you changed your question, but you're saying that they can withstand this and experience no symptoms?

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Q Correct.
A I believe a number of these they note that, one, there's certainly no biomechanical failure. I think in a variety of them there was no reported discomfort or anything associated with these. I don't recall every one specifically. Again, this is just a cross-section. It's certainly not an exhaustive list of all testing that's ever been performed.
Q Do you believe that because there have been a number of laboratory tests done at similar speed changes and similar accelerations to those experienced by Ms. Wolf and her vehicle where people have not had symptoms or not had injuries, that that has an implication for whether or not she experienced symptoms or was injured in this collision?
A Well, again, I didn't do a simple analysis like that. We're pretty clear in the report how we approach this and we have this protocol, and also, as I explained earlier, we're utilizing the scientific methodology where we propose a hypothesis, test that hypothesis, and then validate our results through other published literature.
And so what you're asking is you're kind of skipping a lot of steps that I performed. Again, if you look through the report there's various other things. We're not looking at just solely the acceleration. It seems like you're focused only on acceleration today. You haven't asked anything about anything else that we've done, any other

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means by which we've reached our conclusions, and so we're not doing what you appear to be assuming that I performed.
Q Why don't we try this? Because you've said this a couple of times that either I don't understand or that I'm taking things out of context or whatever. I'm going to ask you one very simple question and let's see how you respond. I want you to walk me through step by step what you did. Start with step one and proceed forward.
A Let's see. If you want to be rather specific, certainly one of the first steps we perform is to review the documents that we received.
Q Review documents. I'm putting that down as step one. What's step two?
A Based upon -- depending upon what is included in those documents, generally that's going to dictate how we proceed to the subsequent steps. In this particular case we were asked to perform a biomechanical analysis. And as we note on page three, the basic outline of performing a biomechanical outline, step one is to identify the biomechanical failures that Ms. Wolf claims were caused by the subject incident.
Q I'm going to make this little bite-sized pieces, okay? So let's say then one is review document. Two is identify the biomechanical failures; is that fair?
A Again, one, and then based upon the documents, that's going

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to dictate exactly what's done, but generally then, yes, the next step is to start with identifying the failures that Ms. Wolf claims were caused by the subject incident.
Q Give me step three, and just step three.
A Well, the next step in our biomechanical analysis is to quantify the nature of the subject incident in terms of the forces, accelerations, and changes in velocity of the vehicle Ms. Wolf was occupying.
Q So as I understand step three, it involves three things that you're quantifying; is that correct?
A Correct.
Q And the three things are the speed change, the acceleration. And what's the third one?
A Force. You can look at the acceleration as the force and the change in velocity, in essence, is dictating the acceleration which is then the same as the force. They might not necessarily be three separate items. Somebody might view them as three separate items, but they are all interrelated.
Q And so the three things that are interrelated is the speed change, the acceleration, and the force?
A Correct.
Q That I have down as step three. What's step four?
A So the next step is we would determine Ms. Wolf's kinematic response within the vehicle as a result of the subject

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incident. This is simply a generic term discussing what we did. Later in my report we get into much more specifics as to what actually is occurring and affecting her kinematic response.
Q By kinematic response, what you're talking about is how her body moved within the vehicle; is that correct?
A Correct.
Q And with regard to that step, step four, determining the kinematic response, that's how her body moved, and essentially that's a description; right? You describe how her body would have moved in the collision?
A No. It's a scientific analysis based upon the laws of physics and the factual information that we obtained in this matter.
Q And give me an idea of the output then. So I'm going to be super specific here. You just said that it's determining the kinematic response. What was the kinematic response for Ms. Wolf?
A In this particular case, due to the restraint provided by the seat, seat back, and head restraint, her orientation, the level of force, in essence she has no significant rearward movement. Her head goes back, goes into contact with the head restraint, and no other movement occurs.
Q So I heard you say that she didn't have significant rearward movement. What movement did she have?

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A Simply enough to compress the seat back. Generally seats of this nature will compress about two inches or so. There's some give to the seat as well.
Q And you determined that kinematic movement based on her orientation and the level of force. And the level of force that you're talking about is the 1.5g's of average acceleration of the vehicle; correct?
A The 1.5g's is the input acceleration from the vehicle. You left out also her restraint that's provided. That's certainly going to affect her kinematic response.
Q What was her orientation?
A She was upright, I believe she said she had both hands on the wheel, I believe foot on the brake. And obviously if her head is contacting the head restraint, she is, in essence, in line with the seat and not out of position to any degree.
Q And are those the sort of orientation data that you use in forming your opinions regarding the kinematic response?
A That's noted in her records and that's what I utilized, yes. Her information that she provided.
Q So you utilized the orientation data that her head was against the headrest?
A Yes.
Q How far was her head from the headrest?
A That I don't know and did not need to know. It wasn't part

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of my analysis.
Q Was her seat in the fully upright position or was it reclined to some degree?
A There's no mention of that. Common reclination is roughly 21 degrees. There's no mention that it's anything other than that, so accepted protocol would be that it's at roughly 21 degrees. And I don't think there's anything in the photographs or anywhere else to suggest that it was anything but that.
Q For purposes of determining the kinematic response did you assume that her seat was at a 21-degree angle?
A Correct. There's nothing to suggest otherwise.
Q Was her seat in the fully forward position, fully back position, or somewhere in between?
A I did not seek that information because it doesn't affect the manner in which I perform my analysis, so I don't know if it's fully forward or fully back. It does not matter in this analysis.
Q Did she have both hands on the steering wheel or just one?
A I believe it was noted both hands. Again, not going to change my ultimate conclusions, but I believe it was noted both hands.
Q Where were they located on the steering wheel?
A Again, I don't know if was ten or two, nine and three. Again, it doesn't matter, but both hands were on the

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steering wheel with at least one document noted.
Q What about the seats on the Subaru, were they the factory seats that came with the Subaru or were they after-market seats?
A Again, there's nothing in the repair estimates or anything else that suggests that they were after-market, so protocol would dictate that you use factory seats. To assume anything else would be unacceptable protocol. There's no information to suggest anything other than factory seats.
Q You assumed that they were factory seats?
A Again, there's nothing to suggest they're anything else. If I were to assume anything, I would be assuming that they're non-factory seats. This is a vehicle sold, it comes with factory seats. Anything else is an assumption.
Q Would that make any difference in your analysis if they were factory seats or non-factory seats, could that change anything?
A Overall I would say potentially no. It depends upon the type of seat, because now you're asking a hypothetical that you're not providing significant information on again, what type of seat, its strength, its characteristics, its height, all those things. But in general, this level acceleration is very minimal and it's well below any established tolerance levels. Certainly you might be able to have some seat that something else extraordinary occurs and it might

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produce an injury, but if it's a typical seat, we would not expect anything.
Q Would anything change in your report based on Ms. Wolf's height or weight?
A I'm not sure what you're asking. Are you saying what's been provided by her medical professionals is not accurate?
Q No. I'm just asking whether it changes anything in your report. In other words, is that a factor that somehow calculates into your findings and conclusions whether the person is tall, short, heavy, fat, light, slight? Any of that matter at all?
A Well, as quite clearly noted on page eight, we do use the age, height and weight of Ms. Wolf that was obtained from her provided documents to determine her seated height and do a comparison to the height of the Subaru and determine what level of restraint is provided based upon her age, height and weight, and the height of the seat.
Q So you're factoring in the level of restraint that the vehicle is providing her?
A In a rear-end collision your primary means of restraint is the seat and seat back, so we're looking specifically at the seat, seat back, head restraint, which most people commonly call a headrest, but it's factually a restraint.
Q What position was her headrest in? Was it in the fully down position, fully up, somewhere in the middle?

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A That I don't know, so we assumed a fully down position. And even in the fully down position, again as noted in my report, that it was more than adequate to provide restraint from hyperextension.
Q Did you find for her height and weight that she was getting adequate restraint from the safety systems on the Subaru?
A Correct.
Q How tall would she have to be before she would no longer be getting adequate restraint from the safety devices on the Subaru?
A I don't know. I haven't run those numbers, but generally I would say for a seat of this height of 30-and-a-half inches with the head restraint in the full down position, we're talking somebody significantly above six feet tall. Now, I don't know how much additional space there is between the top of the head restraint and the roof of the vehicle, if you can actually position somebody in there such that you still could have enough space to fit a head. There are certainly vehicles like the Mini Cooper where basically the head restraint is almost in contact with the roof of the vehicle, so in that sense height wouldn't matter. And I would have to go back and look at this vehicle again and increasing her height to see how that might change the outcome.
Q Step four was determine the kinematic response. What's step

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five?
A So to define the biomechanical failure mechanisms known to cause the reported biomechanical failures and determine whether the defined biomechanical failure mechanisms were created during Ms. Wolf's response to the subject incident.
Q So kind of in laymen's terms, are you looking for the occupant having some kind of movement or motion that is known to cause injury?
A Again, in my report it's quite clear that we note when we're looking at a biomechanical failure mechanism we're looking at both the magnitude of the applied force and the direction of the applied force and then what that response is.
So in the case of -- and we note it pretty clearly again in the report about sprains and strains, that you have to have some type of excessive movement. Depending upon the body part, that's going to dictate how that part moves, whether it's a torsion or a bending, extension, hyperextension, flexion, hyperflexion, various things like that.
Q So as I understand it, you're looking at the magnitude of the force, the direction of the force, and you're looking specifically for whether that caused excessive movement?
A You're mischaracterizing my answer.
Q So you characterize it correctly. What are you looking for when you're trying to define the biomechanical mechanism of

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failure?
Let me back up because I don't want to get your words wrong. What was step five? Say it again.
A Well, now you're asking multiple different questions at different times, so let's go way back and ask what question specifically do want to start with? Because you've asked three completely different questions and backed up and started and backed up, so I'm at a loss as to where you are right now.
Q Let me be very clear. Step number four you said was determine the kinematic response. Tell me again what step number five is.
A Define the biomechanical failure mechanisms known to cause the reported biomechanical failures and determine whether the defined biomechanical failure mechanisms were created during Ms. Wolf's response to the subject incident.
Q And with respect to Ms. Wolf, what did you find in that regard?
A So for the type of cervical spine, thoracic spine, lumbar spine sprain and strain, to produce some type of sprain or strain we still have to have excessive movement. Because the spine can have three dimensional movement, any excessive beyond physiological range of movement could produce a sprain or strain.
However, because we're dealing with a specific event

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that's only producing specific kinematics, what we'd be looking for in this type of event would be hyperextension of the cervical spine, thoracic spine or lumbar spine.
Q And so is that another way of saying what you're looking for is whether there was either hyperextension or hyperflexion occurring, and if there is no hyperextension or hyperflexion then you would find that there is no biomechanical failure mechanism?
A Again, if we're looking specifically at hyperextension which is going to occur or has the potential to occur in a rear-end collision. If it cannot occur, you cannot have any biomechanical failures associated with hyperextension, therefore it cannot occur.
Q Let me ask you this. Do you look for biomechanical failures other than hyperextension and hyperflexion when it comes to cervical spine injuries?
A Again another general question. What event are we talking about, what person? It depends upon what we're looking at and what we might be doing.
Q I'm talking about your investigation. When you're on step number five and you're looking for whether there's been a biomechanical failure mechanism, you described a couple of them that you're looking for. You're looking for hyperextension, you're looking for hyperflexion. I want a complete list. Are there more than just those two for

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cervical spine?
A Well, this is why I was trying to explain all the steps of what I did. And so if you remember, if we back up, we reviewed these documents and we reviewed the event, scenario, and various things like that, the amount of force applied to the vehicle, the direction of the forces applied. Because with my knowledge of biomechanics I can eliminate various things. If we're talking about a rear-end collision, obviously there's no force in a lateral direction. It's not present. So I would not look at that because there's no purpose in that. The way you asked the question you're saying again a generic question of in an event what do you do?
I'm talking about this specific event. We knew at the time we were analyzing her kinematics that her movement would be rearward based upon the contact between the two vehicles. And if we're looking at an injury mechanism due to rearward contact on the vehicle, we would look at hyperextension movements or kinematics. That's what we were looking at.
Q So I think I understand your response, which is if you were looking at a different type of an incident, for example, where someone's head got twisted really hard, in that type of an incident you might look for a hyper-rotation type of injury, but in a rear-end collision you don't look for that,

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you only look for certain things. Am I correct in describing why you couldn't really answer the prior question?
A In a roundabout way you're getting closer to it, yes.
Q Let me be more specific then. When you're dealing with a rear-end motor vehicle collision and you're looking at the occupant of the vehicle that got rear-ended, you're looking to see whether there's a biomechanical failure mechanism of hyperextension and hyperflexion. Are looking for other types of biomechanical failure mechanisms?
A Again, maybe we should back up, because when we're identifying in the first step of the biomechanical analysis, we're identifying the biomechanical failure Ms. Wolf claims were caused by the subject incident. So if we know you have a cervical sprain or strain and it's a rear-end collision, that's dictating that it has to be some type of hyperflexion. They're saying they were injured in this event in this manner. That's limiting to what we're dealing with.
If at some point in time somebody starts to claim a different event, this event occurs in a different fashion, there's some type of different injury or biomechanical failure or that it was created in something other than her inertial loading which is not noted anywhere, I would be happy to readdress that. But in this particular case based

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upon the facts that we have at this time, we're simply looking at some type of hyperextensive movement and we wouldn't look at anything else.
Q And I'm going to ask a clarifying question on hyperextension and hyperflexion. Are you talking about hyperflexion for the cervical spine, the entire cervical spine, or do you look at each inter-segmental level to see whether there's hyperextension, for example, between like C6 and C7 as opposed to like C2 and C3? Are you looking at the overall spine or are you looking at individual segments with regard to hyperextension or hyperflexion?
A In this specific case with Ms. Wolf at her stated age, height and weight in this vehicle, there simply cannot be any hyperextension of either the overall spine or individual components. Again, there's a restraint behind her, so I wouldn't look at it any more than that. There's restraint, there's no hyperextension, therefore we're not going to look at individual components to see what level extension they had.
Q Going back to the kinematic response for a minute, are you familiar with the four phases of whiplash motion?
A Correct.
Q What are the four phases?
A If I remember, I don't know if I remember them specifically because it's not any manner in which I produce these

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analyses, but you have the lower cervical spine tends to move forward, you get kind of an S-bend, then you have some extensive movement, and then generally you're going to have flexion back to the starting position.
Q Is there a certain sort of threshold of forces that are necessary to create the motions that you just described, sort of the four phases of whiplash?
A Certainly. Again, as we note in the report, you have to have forces that rise above the level of muscle response. So you have a normal tension due to just active muscles. They keep us upright, keep us in a normal posture. So you have to have a force that goes beyond that and beyond just inertial properties, so force necessary to create movement of a specific mass. So there certainly are levels. For her I didn't calculate that. Again, there was no reason to that.
Q So what kind of levels does it take in terms of forces before people go through the four phases of whiplash?
A I don't know if I've analyzed that to see the whole four phases, so I don't know.
Q Let me ask you this. Does it apply to Laura Wolf or were the levels of forces involved in her collision, whether you calculated a five-mile-an-hour speed change and an average acceleration of 1.5g's, is that sufficiently low that the four phases of whiplash don't even apply?

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A Well, again, unfortunately when I hear the term whiplash, that's already stating that there's hyperextension. This case doesn't have hyperextension, therefore we don't have those same four phases of whiplash as you're describing or you asked me to describe. Again, whiplash implies that there's some type of hyperextension. We don't have that. This whole phase analogy doesn't apply to Ms. Wolf.
Q Let me ask you about this. There was some research done by a researcher name Ono in Japan who did sled tests and he used video fluoroscopy and he took essentially motion x-rays of people experiencing deceleration and looked to see when that transient S-shape in the cervical spine was present. Are you familiar with that research?
A I have reviewed it, yes.
Q Do you think it's good research? Do you have some reason to believe that his findings are flawed or that the research that Ono did is not reliable research?
A I don't believe so. I mean, he documented what he performed. How you utilize the information he presented, certainly it can be misused. But from what he presented, I don't believe there's anything that would make me say that it's flawed to any degree.
Q And isn't it true that at speeds at about -- speed changes of about four kilometers per hour, that he was seeing this transient S-shape created in people's cervical spines?

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A I don't recall the specific number, but certainly that's something that is occurring.
Q So something in the range of about two-and-a-half miles an hour?
A Let's see. Five kilometers is 3.1. Somewhere in that two-mile-per-hour range, yeah.
Q And Ono found that these were non-physiological movements, that transient S-shape is non-physiological?
A Correct.
Q Did you look to see whether Laura Wolf experienced sort of a transient S-shape in her cervical spine as a result of this collision?
A I did not analyze that. She would experience it. Any time you have a rear-end impact, if you will, a motor vehicle event, you're going to experience it. It might be non-physiological, but again it doesn't produce a failure mechanism and, again, it's well within the limits of human tolerance. It might be non-physiological, but it does not mean it's creating any type of failure mechanisms.
Q When does that transient S-shape start to create failure mechanisms?
A Again, what failure are we talking about? Bone, soft tissue, which ligaments?
Q Any of the above. When do you start seeing biomechanical failure due to a transient S-shape in the cervical spine?

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A Well, again, we have to talk about restraint. And in a particular case like this there's adequate restraint to prevent they hyperflexion. I don't know of anything. Again, there's certainly tests that have been conducted upwards of 40g's of acceleration, and certainly that's going to produce a transient non-physiological S-shape to the cervical spine, and there's not been any reported failures, biomechanical failures due to that non-physiological S-shape.
Q So you've mentioned a couple times about studies involving 40g's. Is 40g's kind of a lot?
A It depends upon what you're looking at, but in the world of automotive of collision, certainly again you could smack a table and produce 40g's quite easily.
Q And the studies that you're talking about, the 40g citation, that's done by the Navy; right? That's that study where they're looking at ejection seats on fighter aircraft and they found it tolerable for people in the pilot seat that are hitting the eject button to experience 40g's during the ejection phase? Is that the study that you're talking about?
A No, not specifically to ejection seats.
Q What are you referencing then?
A So, again, if you look at studies by Weiss. Certainly there was quite a bit of research performed at the Naval

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Biodynamics Lab, which is now the National Biodynamics Lab, a lot of research by Colonel John Paul Stapp at Holloman Air Force Base. So a variety of people have looked at the accelerations in the negative X or the rear direction.
MR. MAXWELL: So I need to leave. I want to tell you gentleman that I took some screen shots from my computer where you were during that acceleration calculator thing. I've e-mailed several screen shots to you, Mr. Elder. What I propose you do is e-mail them to Mr. Nye or choose the one you think best represents the screen shot, e-mail it to Mr. Nye, and if he agrees that it accurately represents the screen as it was when Mr. Probst looked at, then you can e-mail it to Elaine and she could include that as an exhibit to Mr. Probst's deposition.
MR. ELDER: Is that fair enough, Chris?
MR. NYE: Yeah, but you're going to ask me to compare it something I looked at an hour and a half ago?
MR. ELDER: Well, the other nice thing is do a Google search on acceleration calculation and then put it in there yourself and you'll be able to help verify whether it is accurate or not.
MR. NYE: You can send it to me and I'll take a look and I'll run it by the expert.
MR. MAXWELL: You can ask Mr. Probst whether it accurately represents what he saw. But the thing is I'm

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representing to you that I just figured out how to do it with a screen shot off my own computer and I'll represent to you that I e-mailed it to Mr. Elder.

MR. NYE: The purpose being you want to use that screen as an exhibit?

MR. ELDER: Yeah, sure.

Q So on page ten of your report, up at the top there's a reference up there to live human subject torsos were being exposed to rear g levels up to 40g's with no acute trauma, only transient, short-term soreness. Is that what you're talking about with the human tolerance being able to withstand 40g's?

A Certainly again that's one reference. This is the one I've mentioned multiple times by Weiss from the Naval Biodynamics Laboratory.

Q And that's the experiment where they're hitting the ejection button and they're trying to figure out what it's safe to expose pilots to when they're ejecting from aircraft; is that right?

A Again not necessarily. The direction of force applied during an ejection seat is different than the force being applied in this particular test. They were looking at -- again, the title of the paper, Guidelines For Safe Human Experimental Exposure to Impact Acceleration. They're talking accelerations in generalized 3D orientation, not

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just the unique direction as a comparable to an ejection seat.

MR. NYE: Let's take a break.

(Exhibits 4 - 12 marked for identification.)

(Recessed 12:32 p.m. to 1:30 p.m.)

Q Before we took a break, this morning you had identified that you e-mailed your reports to an editor. Do you know her e-mail address?

A I don't.

Q Is it some combination of her name and the letters in her name?

A Generally that's the company's policy, but I just type her actual name, and that's the way Outlook works, and it converts it into her e-mail address. I could probably check and see if I can find it from somebody if you really need it.

Q Yeah, I would like you to do that. What's your e-mail address at ARCCA?

A First initial, last name. So bprobst@ARCCA.com.

Q Which is ARCCA is A-R-R-C-A?

A A-R-C-C-A.

Q And then if you use the same naming convention for your editor, what would that be?

A L. Renner. I think it's R-e-n-n-e-r.

Q And how long has she been your editor?

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A Five to seven years or so. I don't honestly know, but it's been a while.

Q And do you e-mail all your forensic reports to her?

A Not always. I think for a period of time she was moved to a different position, and then obviously if she's not in the office or not able to handle that amount of workload, I would send them to her and it might go to somebody else.

Q But you sent them all to her, it sounds like?

A I believe I would have. Again, aside from those times where I know she's out for an extended period of time and I've been told not to send them so they don't get lost in the Internet or when she was not actually in that position. I think there was a time where she was doing some other type of work at the company.

Q When you e-mail the reports to her, do you e-mail them like in a Word format?

A Generally it's a Word format, yes, so she can edit them.

Q Do you normally delete the e-mails that you send to her after you send them?

A I don't know. There are times where I will just because we have a limit on mailbox size, and so, obviously, if I'm sending a report and it has photographs and then it becomes a large file and it takes up space in what I'm allotted in my e-mail. So it's certainly possible that there's times where various things like that are deleted. I don't have

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any set protocol.

Q You don't have a protocol where as soon as you send it you delete it. It sounds to me like that when you delete your e-mails is when your box is becoming too full and then you just delete everything before a certain date, something like that?

A Correct.

Q Okay. I wanted to talk about a few of the reports that you cited in your paper. I'm going to show you Exhibit Number 4. This is the Szabo study. First of all, isn't it true that this involved five test subjects? And if you need some help identifying it, I think if you turn to page 26 you can see that they're lettered A through E.

A I'm pretty sure this is the one. I think it's brought up quite often that there's five test subjects in this particular study.

Q And for this particular study that Szabo did, he was using changes in velocity of the target vehicle of approximately eight kilometers per hour; correct? And if you want to find that, it's on page 27 under results.

A I'm looking at the methodology.

Q Look under vehicle response right here.

A I'm looking under methodology. So this is how they were performing the tests, that's why it's entitled methodology, and it states right under methodology that six

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16-kilometer-per-hour or 10-mile-per-hour car-to-car impact tests were conducted.
Q They're answering a different question. That's how fast the bullet vehicle was going. I asked you about the target vehicle. And the change in velocity of the target vehicle was approximately eight kilometers per hour, isn't that true? You can find on that page 27 under results, vehicle response.
A There's a difference between the input and the result, and what they were doing was trying to use an input of ten miles per hour. So yes, the results that you're stating that it resulted in approximately that Delta-V is correct, but that's not what their intention was. Their intention was to do a 16-kilometer, 10-mile-per-hour car-to-car impact.
Q Let me be clear. I'm going to ask you a yes or no question. Is it true that the Szabo article specifically states that the change in velocity for the target vehicle was approximately eight kilometers per hour, yes or no?
A That's correct.
Q Eight kilometers per hour is approximately five miles per hour; right?
A Correct.
Q And that would be the same speed change that you found for Laura Wolf's vehicle?
A Correct.

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Q Isn't it true that the test subjects were instructed to relax in this experiment, but they did not have headphones with loud music or blinders to defeat either visual or auditory cues?
A Correct.
Q And that four out of the five test subjects reported transient headaches immediately post impact? You can find that on page 28.
A So it states, Volunteers A, B, C, and E described a transient headache immediately post impact, which resolved spontaneously prior to exiting the target vehicle. Volunteer A, who underwent two rear-end impacts, reported transient minor neck stiffness the morning following the first test. No other symptoms whatsoever were reported by any of the subjects in the one-year period following the test.
Q So would you agree that four out of five had a transient headache immediately post impact which resolved spontaneously?
A Prior to exiting the vehicle, correct. That's exactly what it states.
Q And one out of five reported transient minor neck stiffness the following morning?
A Correct. This was the Volunteer A who underwent two rear-end impacts.

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Q I'm going to show you what's marked as Exhibit 5. So Exhibit 5 is the Castro article that you cited in your report; correct?
A Correct.
Q And this involved 19 test subjects, 14 males and five females; is that correct?
A Correct, 14 men between the ages of 28 and 47, five women between the ages of 26 and 37.
Q And the speed changes that were observed for the target vehicle were in the range of 8.7 to 14.2 kilometers per hour with an average of 11.4 kilometers per hour; isn't that true?
You can find that on the first page right there.
A The results showed that the range of velocity change, vehicle collisions, was 8.7 to 14.2 kilometers per hour, average 11.4 kilometers per hour, correct.
Q So that's a range of speed changes for the target vehicle between 5.5 and 8.8 miles per hour, with an average of about 7 miles per hour; correct?
A I haven't run the numbers to do the conversion, but I'll take your word for it, correct.
Q And in this laboratory test study one of the male subjects experienced a reduction in left cervical rotation for a period of ten weeks. You can find that at the very, very top of the second page.

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A I'm trying to see -- they don't state in there specifically -- because you left out the fact that aside from just vehicle-to-vehicle collision, they also conducted bumper car collisions, and I don't know -- I'm just trying to be specific if this male volunteer noted that after the vehicle-to-vehicle collision or a bumper car collision, and what the actual test parameters were for that individual.
Q So you point out that most of the collisions involved in the Castro study were vehicle-to-vehicle collisions, but they did three bumper car collisions as well involving lower speeds, isn't that true, and lower accelerations?
A Correct.
Q So you're not sure whether that male volunteer that suffered a reduction in rotation of the cervical spine to the left of ten degrees for ten weeks, whether he was involved in the bumper car with smaller forces or the auto-to-auto collisions with the higher forces, but there was such a subject, correct, who reported that?
A I'm just trying to see if they note somewhere specifically which -- because there was no head restraint in the bumper car collisions, and therefore it's a different type of event than what we're dealing with with Ms. Wolf or what would necessarily be occurring in a car-to-car test. So without going through this page by page, I don't see it quickly and easily as to what they say if it was car-to-car or bumper

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car. I guess without going through it again, it says that they were available for seventeen car-to-car impacts and for three bumper car collisions. I don't know if they go into more detail than that.

Q Would you agree that one of the male volunteers suffered a reduction of left cervical rotation of ten degrees and that lasted for ten weeks in this Castro study?

A Correct. Test Subject 2 was noted to have a restriction of rotation of about ten degrees, but clinical examination revealed no pathologic findings in comparison to the clinical examination before the crash.

Q So in other words, people can have a limited range of motion without having anything that's going to show up on an MRI?

A Well, it certainly shows that there is no anatomic change, so there's no mechanical failure associated with this event. So certainly you could have some type of reduction in movement, but it's certainly not due to any type of mechanical failure.

Q So you're not suggesting that the person did not sustain an injury and didn't have a limited range of motion and neck stiffness, you're just saying that there's no biomechanical failure?

A They're not saying anybody was injured in here. They're simply saying he noted a reduction in motion, and again that there was no change from his pre-impact status to his

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post-impact status from a pathologic point of view.

Q And that's because you don't consider someone who gets into a car accident and has a limited range of motion to be an injury?

A Well, again, what I'm discussing is biomechanical failure. So as it quite cleanly notes in this article that there was no failure, there was no change in anatomic structures to him, therefore there was no biomechanical failure to his body.

Q That's really what you would need to see in order to find that there was a biomechanical failure is you would have needed to have seen something on the MRI, something more than just the fact that the person can't move their head all the way?

A That would be an objective finding. Whether or not he can or cannot move is still, truly from a scientific point of view, subjective. So if we did have an MRI and he had some change, certainly that would be an objective finding.

Q But you don't disagree that there was an individual involved in these Castro tests at these types of speed changes that reported a limitation of left cervical rotation of ten degrees and it lasted for ten weeks? That's what he found.

A Correct. Again, I'm not -- if this gentleman did not have any type of restraint, again a different scenario than what we're dealing with with Ms. Wolf. Unfortunately, this

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paper, I don't think it goes into enough detail to state that. So the only thing we can say is that, yes, they report that one individual self-reported a limitation of cervical range of movement.

Q And out of these 19 people that underwent these tests with speed changes in the range of 5.5. to 8.8 miles per hour, one female and four male test subjects reported symptoms afterwards? That's on page 373.

A I don't see where they go in to any more detail, but then they note that for some people they did report some different symptomatology. One person who had been taking malaria prophylaxis, they attribute some conditions to that. But again, overall they note no injury, no pathologic findings comparing pre-impact conditions to post-impact conditions, including people with degenerative changes. So some people noted muscle soreness or some type of transient change, but again no injuries or mechanical failures.

Q You're using both terms injuries and mechanical failures here. So again I just want to clarify. So when people were reporting that they have limited range of motion and they can't move their head in left rotation, they've lost ten degrees of range of motion, you don't consider that to be either a biomechanical failure or an injury?

A In the context of this paper, and if you read the paper, it states quite clearly out of all these people, people with

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and without degenerative changes, with and without head restraints, impacts of greater than we have, nobody had any type of mechanical failure, there was no change in any of the objective studies pre-impact to post-impact, so there were no biomechanical failures. That's what I'm stating is reported in this paper.

Q Didn't you also say that that's not an injury? There's a transcript, so we'll be able to see. Correct me if I'm wrong. You said that that's not an injury?

A If you can maybe refresh my memory what you're meaning by that's not an injury? That's quite an incomplete question again.

Q We'll see the transcript.

Let me ask you this. Tell me if I read this correctly. Here's where I'm going to reading from, page 373 right down at the bottom: Evaluation of the physical examinations at time 2, i.e., 18 to 24 hours after crashes, revealed that one female and four male test subjects reported symptoms.

Did I read that much correctly out of the Castro article?

A No.

Q What did I read incorrectly?

A It's 18 to 25 hours, not 24.

Q Oh, I'm sorry, 18 to 25 hours, not 24. I'm going to try it again because we're going to get a clean transcript out of

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this.
Tell me if I read this quote correctly: Evaluation of the physical examinations at time 2, i.e., 18 to 25 hours after the crashes, revealed that one female and four male test subjects reported symptoms.
Did I read that correctly?
A You did.
Q And tell me if I read this correctly: Test subject number 1, a female age 37, with a change in velocity of 13.6 kilometers, had sensation of muscle soreness in the cervical spine for three days.
Did I read that correctly?
A Correct.
Q Test subject number 2 had sensations of muscle soreness in the cervical spine and lumbar spine complaints.
A That's correct.
Q Test subject number 3 had headache persisting for 13 hours after the crash and sensations of muscle soreness in the cervical spine persisting until the seventh day; is that correct?
A Correct.
Q Test subject number four, a male 30 years old with a change in velocity of 14.2 kilometers per hour had nausea and vomiting a half hour after the crash, this test subject had received malaria prophylaxis shortly before the experiment.

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and sensation of muscle soreness in the cervical spine.
Did I read that correctly?
A Correct.
Q So out of nineteen people, at least five of them reported some level of symptoms after these crash tests that are reported on by Castro; isn't that correct?
A Correct, they reported symptoms. Again, as we stated before, subjective findings, but no objective findings. Had you continued to read through the paper, most of them still say clinical examination revealed no pathologic findings in comparison to the clinical examination before the crash.
Q I'm showing you what's been marked as Exhibit 6. This is a report by Nielsen that is referenced in your report on Laura Wolf; is that correct?
A Correct.
Q On page 194, Table Number 2, you can see that there were seven subjects in this study; correct?
A Correct.
Q They were all male; correct? Page 190.
A Correct.
Q All of the people taking part in this study were members of the engineering team that was the author of the paper, plus a physician that assisted with the study; isn't that true? It's on page 190.
A The test volunteers were all males, one was a

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physician/kinesiologist, the remainder were members of our engineering staff.
Q And by "our", that's the authors of the paper; correct?
A Correct.
Q And the speed changes involved in this study were in the change of 1.1 to 5 miles per hour; isn't that true? You can find that starting at page 202.
A So Delta-V for the struck vehicle at lowest 1.7 kilometers per hour and a maximum of 9 kilometers per hour.
Q So we're talking -- oh, there's a 9 in there? Okay. So they did 25 tests. There's one at 9, which the 9 would be up in the range of about 7 miles per hour, actually a little less.
A So 10 kilometers is 6.2, 5 is 3.1. So somewhere less than 6.2 miles per hour.
Q One was up that high, but all the rest of them are in the range of 1.1 to 5 miles per hour; correct?
A Again it varies from 1.7 to 9, and there's various ones, yeah, 5, 7, 8 kilometers per hour. So approaching, if not at, 5 miles per hour.
Q And of the seven test subjects, two reported symptoms. One reported headache and one reported cervical spine ache; isn't that true? Page 196.
A So this was also following both the frontal and rear-end impacts, two volunteers, both involved in multiple test

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series on the same day, reported symptoms.
Q And am I correct in believing that one test subject reported headache and the second one reported cervical ache?
A Correct, following both frontal and rear and multiple impacts all within a day's time.
Q I'm going to show you Exhibit 7. This is the Braun study that you cited in your report, correct, on your report on Laura Wolf?
A Correct.
Q That involved seven test subjects?
A Correct.
Q The largest speed change for any of the collisions was 4.8 kilometers per hour, which is about 3 miles per hour; correct?
A The range for the target vehicle was 1.5 to 4.5 miles per hour.
Q Speeds below the speed change -- or speed changes below the speed change that you found for Laura Wolf; correct?
A Correct.
Q And three out of the seven subjects reported minor neck stiffness the day after the test was concluded?
A Three of the participants that had multiple exposures had minor neck stiffness, but not pain that resolved without treatment in one day, correct.
Q The duration of the collision was measured by Braun; isn't

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that true?
A Correct.
Q And he found that the range of durations of collision was .09 to .124 seconds?
A Correct.
Q It wasn't the purpose of this test to reach or exceed any injury threshold, was it? That's a direct quote from the first page of the full article.
A In the introduction it says, Accident reconstructionists and biomechanical or biomedical engineers are frequently called upon to analyze low speed rear-end automobile impacts and assess the potential for any injury to have occurred to the occupants of the vehicles The key issues in these types of accidents are typically the speeds and forces involved in the impact, and whether or not these speeds and forces were sufficient to cause injury. Several studies done in the 1990s have attempted to address these issues, citations 1 through 8. The database of human exposures and our understanding of human tolerance to rear-end impacts continues to grow as additional work is published. Our testing is intended to add to the growing body of research related to occupant kinematic response to low speed rear-end impacts and to further quantify the vehicle dynamic response that would be typical of the bumper systems in use in modern passenger vehicles.

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And then they list three separate objectives. The first one, to add to the human exposure database by testing human volunteers in low speed rear-end impacts at a level that was at or below the level currently associated with no significant risk of injury.
The second objective was to subjectively describe and characterize the severity of the impact that was experienced by the occupants.
And the third objective was to evaluate the vehicle dynamic response to low speed rear-end impacts.
Q Is it true, and is this a direct quote, sir, that the paper's authors said, and I'm going to quote, quote, It was not our intent to reach or exceed an injury threshold? Did I read that correctly?
A Correct.
Q Handing you Exhibit Number 8, this is the West article that you cited in your report related to Laura Wolf; correct?
A Correct.
Q This test involved five test subjects?
A Correct.
Q The peak acceleration of the target vehicle was 3.1g's; correct? You can find that on the table at the bottom of the right column of the first page.
A In Series A the peak vehicle acceleration varied from 0.9g's to 3.1g's.

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Q And so going back to that, when they had a peak acceleration of the vehicle of 3.1g's, the occupant of the vehicle experienced head peak acceleration of 3.0g's in the X axis direction 3.4 g's of head acceleration in the Y axis direction, and 2.8g's of head acceleration in the Z axis; isn't that correct?
A Correct. That's not simply noting the inertial loading, that's inertial and contact acceleration of the head.
Q Understood. And the orientation, just so the record is clear, the X is in the longitudinal direction, which would be sort of forward and back; correct?
A Correct.
Q The Y is in a lateral direction, which is basically side to side; correct?
A Correct.
Q And the Z axis is in the vertical direction, which is up and down?
A Correct.
Q Isn't it true that West found that there was significant rebound of the subject's head from the head support that was occurring when the striking speed was 8.7 kilometers per hour or higher, so basically a little over 5 miles per hour or higher speed change?
A That full paragraph reads, For the first three impacts the displacement of the test subject's head was insufficient to

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cause his head to contact the head support. Significant rebound of the subject's head from the head support did not occur until the striking speed was 8.7 kilometers per hour, 5.4 miles per hour or greater.
And I'm trying to see if they later describe what they mean by significant rebound of the head. That's, again, simply a descriptive term and not a quantitative term.
Q But they did find that there was significant rebound of the subject's head once the striking speed was 5.4 miles per hour or greater; correct?
A Well, taken in full context, they're saying at speeds below that there's no head contact, therefore there can be no rebound. And then at some point, obviously, you do have some rebound, meaning you go from none to something that's measurable, meaning significant, and that did occur at this level of 5.4 miles per hour or greater.
Q Okay. And if you go back to the first page, you can actually find the specific test where they started to observe that, the line and the table there where it's got a striking speed of 8.7, that involved a peak vehicle acceleration of 2.8g's and peak head accelerations of the occupant of 7.5g's, 3.3g's and 2.9g's in the X, Y and Z axes respectively; correct?
A At 8.7 kilometers per hour, that's 5.4, and that is correct, that is what that table does read.

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Q So in a situation where you had a peak vehicle acceleration of 2.8g's, that's when they started to see the significant head rebound, as they describe it; correct?
A Again, anything below this, and as it notes for the first three tests, there's actually no head contact, so there can't be any rebound, everything else in between there's contact but no rebound, and until you get to a level at 5.4, that's the only time where any significant rebound was observed.
Q The 5.4 that you're talking about, that's the striking speed; right? That's not the speed change of the target vehicle. They're using the term striking speed?
A I apologize. I stand corrected. I'm looking at the peak vehicle acceleration. It's roughly 3, so it's fairly comparable again to the case we're dealing with here today.
Q Just so we're comparing apples to apples, they started saying rebound in the example where the peak vehicle acceleration was 2.8g's. In Laura Wolf you calculated 3.0g's for the peak vehicle acceleration; correct?
A Correct. Again, assuming that all the damage noted did, in fact, come from this event. So that's a maximum that it could possibly be.
Q In this West study, out of the five test subjects, two of them reported minor neck pains lasting for one to two days; correct?

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A I think I even note that in my report, but correct.
Q And the tests were being performed with the head rest in the retracted position, so all-the-way-down position, and at 5.9 miles per hour of impact speed the test subject said that he would no longer continue with the testing unless the headrest was raised; correct?
You can find that on page three up at the top where there's a description of that.
A Correct, at any speed additional to that he requested that the head support or head restraint be extended to allow for higher impact magnitudes.
Q Showing you Exhibit Number 9, this is the Mertz paper that you cited in your report on Laura Wolf; correct?
A Correct.
Q This test involved just a single human test subject; correct?
A Correct.
Q And just tell me if I read this correctly. I'm starting at the beginning of the article. It says: The so-called whiplash syndrome constitutes the most prevalent trauma to occupants of automobiles struck from the rear. It is particularly insidious with subtle pathology that often does not show up with radiographical or other quantitative diagnostic techniques. The acute or chronic symptoms sometimes persist for years, and in the case where there is

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no immediate obvious morbidity, injuries attributed to the accident show up months later.
Did I read that correctly?
A You added an extra word, but in essence you read it correctly.
Q Do you generally agree with that assessment by Mertz in the article that you cited?
A If you simply go by numbers, there are more claims of whiplash generally than any other type of injury in rear-end collisions. However, this is a difference between a claimed injury and an actual investigation. Basically if you look at the purpose of this paper, they're noting that, yes, quite a number of people claim to have been injured, we're going to see if that is, in fact, an actuality when we look at these events. And if you look at the conclusions, what they determine is that we don't see mechanisms in a typical collision of the forces we're discussing to actually produce mechanical failure.
Q I'm going to show you Exhibit Number 10. Earlier in your testimony you referenced that you calculated the peak acceleration of the Subaru in which Ms. Wolf was driving at 3.0g's, and you indicated that there was a spreadsheet where you derived that. Is Exhibit 10 the spreadsheets that you're referencing?
A Correct.

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Q When I look at that, it looks like when you printed that out it just captured the formulas that are present in each of the Excel spreadsheet cells, it doesn't actually show you the values of those formulas being run; is that correct?
A Correct. If somebody wants to recreate the work I did, this is certainly what they would need. It actually shows the formulas, the algorithm that was employed.
Q And that's where you derived that, even though the peak acceleration of the Subaru --
Let's try that again.
That's where you derived that, even though the average acceleration of the Subaru in this collision is 1.5g's, the peak acceleration of the Subaru is 3.0g's?
A Correct.
Q And where did you get the formula or algorithm that you're using in order to make that calculation?
A I did not create this spreadsheet. I believe it was by a physicist in our office. I could be mistaken, but I'm pretty sure this was done by a physicist.
Q Now, it turns out in the context of Laura Wolf's case that there's a 2-to-1 ratio between the peak acceleration and the average acceleration. Does this formula always produce that same 2-to-1 ratio or is sometimes that ratio different?
A I haven't investigated that, so I honestly don't know. I'd have to play with some numbers to see if that's actually the

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case.
Q Now, one thing that I note is in the Laura Wolf report you never say that the peak acceleration of the Subaru is 3.0g's; correct?
A I don't believe that I do, no. There was no reason to.
Q You only cited the average acceleration of 1.5g's?
A I believe so, correct.
Q You actually reference it two different ways. Once you reference it as the average acceleration associated with a 5-mile-per-hour impact as 1.5g's, and the other time you reference it as the peak acceleration experienced by the subject Subaru in which Ms. Wolf was seated was comparable to 1.5g's. So you reference the 1.5g's using two different terminologies; correct?
A Well, to be fair, we do note that it's 5 mile per hour, the average acceleration is 1.5g. That's on page five. And then I think we note a couple other areas that same value. Under findings on page seven, change in velocity was comparable to 5 miles per hour with average accelerations comparable to 1.5g's. Then on page nine we say the subject incident had an average acceleration comparable to 1.5g's. Then on page ten we say the subject incident had an average acceleration comparable to 1.5g's. Then on page 11 we say the subject incident had an average acceleration level that was comparable to 1.5g's. Then on page 12 under conclusions

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we note that the incident was comparable to -- well, had an average acceleration comparable to 1.5g's.
The one incident where it's noted that it says peak acceleration, we've discussed before that unfortunately my writing style might lead to some confusion by people such as you, but meaning while we've stated quite clearly multiple times we're discussing the average acceleration, I was trying to be more clear in that we've looked at a worst case scenario saying this would be the highest average acceleration that we could possibly produce. So that one sentence you've the cited is simply trying to clarify something.
Q Is it your normal practice to only reference the average acceleration, in this case the 1.5g's, and not reference the peak acceleration, which in this case was 3.0g's, when you write your reports?
A Sometimes I do peak, sometimes I do average. There's no real reason why I might do one or the other. Sometimes it's easier for people to understand that, obviously, this is a very short duration event, and so instead of looking at a momentary point in time of the acceleration, we're looking at basically what's occurring over the entire length of this event. Sometimes it just depends on what we think might be easier for somebody to understand in reading this report.
Q Well, comparing apples to apples, and I'm going to use the

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West report which has a listing of various peak vehicle accelerations, and comparing that to Wolf's vehicle's peak acceleration which was 3, as you calculated it, there's a number of these that are right in the neighborhood in West's report. Here we've got 3, 2.8, 2.9, 3.1 for vehicle acceleration. So you would consider those to be pretty similar, wouldn't you?
A Math being what it is, those numbers are all fairly close to 3, correct.
Q And then when you look at the occupant's head acceleration in the X, Y and Z planes for those involving the similar vehicle accelerations, you're looking at things in the X plane in the range of 4.8 to 8.3g's; correct?
A We explained this, I guess, at length that that's a contact acceleration. Again, that's why if you note in that paper they say the first three tests there was no head contact to the head restraint, and if you compare the vehicle acceleration roughly to that head acceleration, they're comparable. There's no amplification like there is when you actually have head contact. So that's an artifact of head contact to the head restraint. It's not inertial acceleration, it's not acceleration that produces a mechanism for hyperextension failure.
Q But again you're looking at accelerations of the head in the X direction, the longitudinal direction of between 4.8 and

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8.3g's in a collision like this one with Laura Wolf?
A Correct.
Q And you're looking at accelerations of the head in the Y direction, in other words, the side-to-side lateral direction, in the range of about 3.0 to 3.4g's?
A Correct.
Q And you're looking at accelerations in the Z direction, basically the up-and-down plane, in the range of about 2.8 to 2.9g's?
A Correct.
Q And those are all happening simultaneously. So the person's experience of their head moving feels like it's moving in three different directions, you have to do the math of all of those, but it's going to be something greater than any of those numbers; correct?
A Just to be clear, you're saying these are all happening simultaneously. Yes, the head, because it's in three-dimensional space, it is experiencing three-dimensional acceleration. However, these peak head accelerations are not necessarily all happening at the same time temporally. So you might have little-to-no acceleration in one direction, while you have more in the other. And, unfortunately, this paper did not include any figures or timing that I can see readily as to when those peaks occurred. And so without knowing when those peaks are

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occurring, you can't do super-position to actually combine the three directions to determine an overall peak head acceleration.

Q So it may not be the worst case scenario. In fact, it probably isn't the worst case scenario where you would literally take all three of those maximums at the same time?

A That would be the worst case scenario where you're taking all three peak head accelerations, assuming they're all occurring at the same time, would give you a worst case scenario.

Q It's been a while since I've been in math, but working out the formula for this is you'd take the X acceleration, square it, the Y acceleration, square it, the Z acceleration square it, and take the square root of the whole thing, and that would give you pretty close to the peak acceleration worst case scenario; correct?

A Correct.

Q So is there any reason to believe that Laura Wolf's head did not have the kind of head accelerations consistent with what we're seeing in West's report for when he's got vehicle accelerations in the range of 2.8 to 3.1g's for peak acceleration?

A It's possible they are head contact accelerations. I know of no reports of any type of head mechanical failure associated with any direct contact, but certainly it's

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possible that you could have some contact accelerations that are comparable to those.

Q So did you write anything up in your report suggesting that she might have had head accelerations in the range of like 4.8 to 8.3g's in the lateral direction? Did you think to comment on something like that in your report?

A Again, there would be no purpose in doing that. I could report on a lot of things. I don't think I mentioned the color of the car. It has no bearing in my analysis, and so many things like that are simply not reported.

Q Let me ask you this. You're saying that there was a peak vehicle acceleration of about 3.0g's and now you're acknowledging that her peak head acceleration may have been something in excess of 8.0g's, and then you're making a comparison between g-forces involved with activities of daily life and the g-forces people experience in daily life. Wouldn't it be more fair to compare head accelerations with activities of a daily life than car accelerations with activities of daily life?

A Again, I think you're kind of confused. What we're looking at when we're comparing any type of vehicle-and-vehicle, we're looking at input accelerations versus response accelerations. And certainly in certain cases we do look at -- again, we're looking at inertial responses, not contact acceleration responses. Unfortunately, I don't know if

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you're confused in looking at a variety of different things, but we're looking at a valid fair comparison between input acceleration from one test vehicle to another test vehicle and then relating that to other daily activities as well.

Q Before we took a break this morning we were going through the various steps that you go through in your analysis and we only got part way through when we took a break. I'm going to get us back on that subject, so I'm going to review one through five as I have them written down.

Number one, review documents. Number two, depending on what is included in those documents it will make some difference as to how you proceed, but in this case your second step was to identify biomechanical failures. Number three, you quantified the nature of the collision. There you're looking for the speed change, the acceleration and the force. Number four, you determine the kinematic response, in other words, how the body moved. Number five, you're going to define the biomechanical failure mechanisms known to be involved. And I think that's where we left off.

So can you give me number six for where you go next in your analysis?

A To evaluate Ms. Wolf's personal tolerance in the context of her pre-incident condition to determine to a reasonable degree of scientific certainty whether a causal relationships exists between the subject incident and her

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reported biomechanics.

Q So in other words, you're looking at the types of activities that she's involved in historically, and then you're looking at the kinds of forces that would be involved in those types of activities?

A Correct.

Q And why do you look at that?

A This is for her personally. So we're not generalizing this to, again, the general population. This is we're looking at this unique event with this unique individual with her unique personal tolerant values given whatever her pre-existing conditions might or might not have been. That tells us, again, specifically something about her.

Q Let me ask you this. Let's assume the lowest possible movement that you could have for a person and that the person is just a total couch potato, they don't do anything but sedentary, and compare and contrast that with a situation where the person is kind of like Ms. Wolf where she's pretty active and plays dodgeball and does rock climbing and goes running and stuff like that. Does that difference make a difference with regard to your opinions when you're finding that the speed change is about 5 miles per hour and the acceleration from the collision has a peak acceleration for the vehicle of about 3.0g's?

In other words, if you're finding -- maybe I should have

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asked it that way first. If you're finding 5 miles per hour of speed change and 3.0g's of peak acceleration for the vehicle, is it going to make a difference whether the person is a couch potato or out doing rock climbing in terms of your conclusions?

A Potentially. It depends on what the injury mechanism is or their pre-existing condition. Because certainly if somebody is fully sedentary, that means they're only -- the most precise I can be in their personal tolerance level, if I only know that this person is sedentary and I know nothing else, I can say they can withstand 1.0g. Now, if they just move their body, any movement whatsoever, it certainly rises above that 1.0g. But, obviously, unless somebody -- I think they had article the other day, somebody who was bedridden for 47 years with polio, he would be somebody who does not move whatsoever and only experiences 1.0g of force. But certainly once we're looking at things beyond that, it does allow us to look at events like this and say here is an event of comparable, greater, or less magnitude, whatever it happens to be, and here's the forces associated and here's the outcome to this individual such as Ms. Wolf.

Q Let me ask you this. You're sort of looking at the severity of the forces in the collision versus the severity of what they're engaged in the rest of their life. And doesn't it make a difference that when she's out rock climbing she

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knows she's rock climbing and she's expecting to be climbing rocks, whereas when she gets into a car accident it's kind of one of those things where you just get hit out of the blue? Is that significant in any way or not really?

A Not really. Again, you asked about automotive accidents where they put blinders on people and headphones so they're not aware. In just some of the papers we went through people were aware. So they've looked at that difference and there's no significant difference between the two.

And if you look at it actually on a structural point of view, her cervical spine has no cognitive awareness. Her cervical spine doesn't know what will or will not occur, what is occurring. It only can respond to an input per laws of physics and engineering science. So regardless of whether she's aware or not, if there's a force applied to that structure, that force must obey the basic laws of physics and respond always the same based upon an input force.

Q Well, it's not that her cervical spine has a consciousness or expects anything or doesn't, but isn't there a factor associated with muscle tension that it can either sort of increase or decrease the amount of kinematic movement that occurs based on whether people tense up their muscles before a collision or not?

A Again, in my report, and as we said earlier, if it is enough

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force to overcome muscle reaction force. So certainly you have a basic level of muscle force just due to posture. If you are tensing up, certainly you are a little bit stiffer, but then that places you -- if you're not moving, and studies have shown when there's increased muscle stiffness you actually have less movement and less muscle reaction force. And so if you have less movement, you have less potential for any type of hyperextension, hyperflexion, any hyper movement or sprain or strain injury. And certainly less force in the muscles is less than anything. So in examining any of that like this, I assume there's no awareness, no pre-tensing or anything. And again this is a worst case scenario that might have happened. If she had any awareness of this, then it just simply means there's even less likelihood of any type of mechanical failure.

Q You said step six was evaluate her personal tolerance. What's step seven?

A Well, it's not noted in here necessarily, but again we discussed this earlier, that basically what we're doing is this -- instead of going through and saying we're applying a scientific methodology, this is our hypothesis, this is our test, in essence these last five steps I gave you are, in essence, our testing phase of that methodology, and then the next phase of using the scientific methodology is validation, external validations from some other source, and

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that's where we have quite a number of these references cited. I say when many other people have looked at many other impacts with many other subjects with and without pre-existing conditions and at levels comparable to this and greater, there's been no type of mechanical failure. So my independent analysis is validated by others in the scientific community.

Q So step seven is your validation step?

A Correct.

Q And when you're doing validation, do you look for only articles that confirm your data or do you look for articles that would contradict your data?

A I look for any and all articles, and to date I haven't found any tests that have been staged or conducted that show there's some type of mechanical failure such as she reported to have in an event like this under similar conditions of restraint, force levels, things of that nature.

Q Have you found any articles where people are sustaining injuries in motor vehicle collisions with speed changes and acceleration, peak acceleration of a vehicle similar to what you found in Ms. Wolf's case?

A Are we limiting this to just a pure rear-end collision with no --

Q We're talking about rear-end collisions, someone seated in an automobile, wearing their seat belt, they get into a

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collision with similar forces. In other words, studies that are comparable to this incident involving Laura Wolf where the study supports that people do get injured in these collisions.

A I've never seen anything that supports that you would receive mechanical failure in an event of this nature with a vehicle of this design, restraint of this design. The only article I'm really aware of is where they took a ligamentous spine, so they removed all the skin, all the musculature, all the flesh, basically, and only left the bones, if you will, and some attached ligaments to the spine, and then subjected that to significant loading where some type of failure occurred. But, obviously, Ms. Wolf was not in this vehicle with purely a ligamentous spine. So I'm unaware of anything, any peer-reviewed published literature that shows in an event like this under similar circumstances some type of mechanical failure would occur.

Q What about any articles that are specifically looking at and studying tow hitches, tow bars, and whether that increases either the severity of the collision when they're involved or the likelihood or severity of injuries, have you come across any such scientific articles?

A No scientific articles. Certainly you run across lots of anecdotal information of a wide variety of things. I don't know if there are any mention of tow hitches specifically,

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but again not something that's scientific that says if you have a tow hitch in an event like this you will receive these specific failures.

Q Now, do you have any opinion as to whether Laura Wolf was injured in this collision or not?

A Again, my report's quite clear. What we're looking at is mechanical failure. There's not a mechanism for any mechanical failure. So it's up to everybody else to say, okay, if there's no mechanical failure, you can't go beyond this step. So if there's an injury, or whatever happens to be associated with some mechanical failure, that mechanical failure can't occur, no sequelae, nothing else can come from this event.

Q So I understand that you're going to be saying that there's no biomechanical failure. I'm asking you a different question. Are you going to be testifying on a more probable than not basis that either Laura Wolf was injured in this collision, was not injured in that collision, or do you simply have no opinion on the injury question?

A I'm simply looking at it from a biomechanical point of view and strictly discussing biomechanical failure.

Q Will you been expressing an opinion that Laura Wolf was not injured in this collision?

A As I said multiple times, I'm simply discussing biomechanics, biomechanical failure, and that in this event

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there was no biomechanical failure mechanisms.

Q So is your answer no?

A I'm very specific in the answer, and I'm discussing biomechanics and biomechanical failure.

Q Sometimes I think no and yes aren't in your vocabulary because I ask you yes/no questions and you won't answer yes or no. I need to know. If you're going to say that she was injured or uninjured in this collision, I need to know. I know you're going to say some other things. I didn't ask you those questions. I asked you: Will you be expressing an opinion as to whether or not she was injured in this collision?

A Again, I'm just trying to be very specific. As I've stated before, there's a wide variety of people who confuse quite a number of terms, failure, biomechanics, injury, anything like that. I don't want to have somebody misunderstand what I will and will not been doing, so to be specific I always say that I'm simply discussing biomechanics and biomechanical failure mechanisms.

Q You reviewed a number of medical records in this case; is that true?

A True.

Q Did Mr. Nye provide those records to you?

A Correct.

Q Did Mr. Nye provide you with the medical report from Dr.

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Battaglia, who was the doctor hired by the defendant to interview Ms. Wolf, examine Ms. Wolf, review all of her medical records, and express opinions, did you review that report from Dr. Battaglia?

A I have not reviewed that record, no.

Q Did Mr. Nye share you with the declaration from Dr. Koo which states that Ms. Wolf sustained injuries in this motor vehicle collision including a torn rotator cuff?

A I don't believe that I've seen that, no.

Q Did Mr. Nye supply you with the declaration from Dr. Katherine Ellison, a chiropractor, who expresses opinions that Ms. Wolf was injured in this motor vehicle collision from June 15th of 2009, and that she sustained various injuries, including cervical strain, thoracic strain, lumbar strain, and a shoulder injury?

A Well, I might save us some time. I don't think I have any declarations, so I don't have any declarations from any other experts.

Q How about the opinion from Dr. Peterson who signed a sworn statement that Ms. Wolf was injured in this motor vehicle collision, did you get that from Mr. Nye?

A I do not have any record of receiving that, no.

Q Does it make a difference to you that those four physicians, Dr. Battaglia, Dr. Koo, Dr. Ellison, Dr. Peterson, all come to the unanimous conclusion that Ms. Wolf was, in fact,

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injured in this motor vehicle collision?
A First off, I don't know what they did or did not do, what materials they reviewed, what methodology they employed, I have no way of saying anything to the validity of their results. And simply because they have numbers, it's kind of meaningless. I think we've all heard the old adage that two wrongs don't make a right. So four wrongs don't necessarily make a right, either. So it has no bearing whatsoever on me whatever they have said. I've done my own independent analyses.
Q Let me ask you this. Do you think that there's any kind of conflict between the fact that you've got four doctors, some are treating physicians for Ms. Wolf, one of them is hired by the person who caused this motor vehicle collision to investigate the nature and extent of injuries, and all four of those doctors are concluding that she was hurt in the motor vehicle collision, do you see any conflict between their opinions and your opinion?
A Again, I don't know what work they have performed, what they did or did not do. If they know anything about the incident kinematics, what actually did or did not occur, so I don't know what basis they have for reaching the conclusions that they do have, so I can't answer that question without knowing what they did and how they did it and how they arrived at the results and what the basis is.

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Q You were on step seven, which was validation from other sources. What's step eight?
A Basically write the report. I mean, we've finished everything there.
Q Let me ask you. In your report on Laura Wolf you reached a conclusion number -- I guess it's not actually listed under conclusions one, two, three or four, but just after number four in your report you state, A causal relationship between the subject incident and the shoulder biomechanical failure cannot be made.
So you're basically, as I understand it, you're saying that there is no causal link; is that right?
A Correct. Just to clarify. I'm not sure -- it appears that there is a formatting error there, that maybe that paragraph should be a number five. It doesn't make any sense that it would be separated out like that as a paragraph after the conclusions, so it should be number five.
Q So it is number five. And you're finding that there's no causal relationship between the collision and biomechanical failures; is that right?
A We say that there's no biomechanical failure in this incident, and therefore you can't have a causal relationship between a claimed failure and the subject incident.
Q Now, I'm trying to figure out if that means something different than that there's no causal relationship between

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the collision and her injuries.
A We've kind of been through this discussion of biomechanics quite extensively, and again I'm simply stating whether or not there's biomechanical failures.
Q I still have a hard time figuring out whether you mean something different by a biomechanical failure than injury or whether those terms are synonymous. Can you help me out here?
A I can't. That's your knowledge, your background. I know my point of view is coming strictly from biomechanics. That's my education, experience, background. That's what I'm discussing. I don't know what your background is or your knowledge of any this. I can't explain it any differently.
Q Let me add one more layer onto this and ask you about another thing. Did you review the stipulation that was signed by Mr. Nye on behalf of his client, and I signed it on behalf of my client, Laura Wolf, that specifically stipulates that Ms. Wolf was injured in this motor vehicle collision?
I'll read it to you here. Paragraph three, Ms. Wolf sustained cervical, dorsal sprain/strain injuries in the July 15th, 2009 motor vehicle collision.
That's already been stipulated to by the counsel of record for the parties. Was that shared with you?
A I don't believe so, no.

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Q I'm trying to figure out how your testimony can be useful or helpful when we've already stipulated that Ms. Wolf was injured in the collision. Can you help us out? Can you explain from an engineering point of view how testimony regarding biomechanical failure might be helpful to a finder of fact in a case where there's already been a stipulation that Ms. Wolf was already -- that she was, in fact, injured in this motor vehicle collision?
A I don't know --
MR. NYE: Object to the form of that question. Go ahead.
A I don't know what, if anything, Mr. Nye was doing with that information, if he decided just from a legal tactical point of view to concede something whether it's factual or not. It might just be a means by which for him to move the case forward to meet a mutual resolution. I have no idea why he did what he did. Again, it has no bearing upon the actual facts and scientific analysis of this event. Again, as I said, I present information. What somebody chooses to do with it, that's up to them.
Q Well, let me put it this way. Ms. Wolf, she will testify that she was injured in this motor vehicle collision, so will all of her treating physicians, so will the defense doctor, everyone is going to get up on the stand and say that she was hurt in this motor vehicle collision. Do you

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think your testimony that there was no biomechanical failures adds something relevant to the discussion at that point?

A Certainly.

MR. NYE: Object to the form.

A Certainly. Nobody -- as far as I understand, Ms. Wolf is not a biomechanist, she has performed no type of accident reconstruction, force analysis, kinematic analysis, biomechanical failure analysis. I'm unaware of anybody else performing anything like this. So if you're simply looking at a difference between a lay person's point of view, a medical physician who's simply using differential diagnostics, and somebody applying scientific and engineering principles, they are three separate things and each adds something different.

I'm looking at pure physics, engineering science. It's something different than Ms. Wolf's perspective. And it's vastly different than a treating physician's point of view, as their primary concern is treating her, not what caused this event, so I don't know why any of her treating physicians would look at anything involved in this to determine what actually happened. It's of no concern to them.

Q Let me be clear. The doctors aren't just unanimous that she's hurt. They're unanimous that she was hurt in the

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motor vehicle accident as a result of the motor vehicle accident. Does that make any difference in terms of your opinions as a biomechanical engineer?

MR. NYE: Objection; asked and answered.

A Again, mine is an objective, factual, scientific analysis. Strength in numbers, again as I pointed out, is meaningless. You can have quite a number of people who all believe -- let me go back to Flat Earth Society. Obviously quite a number of people believed that. They were wrong. Strength in numbers when it's not supported by facts is meaningless.

Q Let me ask you this. Because Ms. Wolf and all of the doctors in the case are testifying that she was hurt and hurt in this motor vehicle collision, are you suggesting that they're all wrong?

A I'm suggesting if you provide me documents that shows on a factual scientific basis how they reached their conclusions that's not relying upon subjective information, I'll look at that and I'll answer your questions based upon their research and their work.

MR. ELDER: I've referenced both the Battaglia report and the stipulation, so I'm going to get both of those marked as exhibits.

(Exhibits 13 and 14 marked for identification.)

Q Maybe we can move all those exhibits to the side for a

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minute, and I've got a bunch of reports that I'm going to have marked, and then I'm going to ask you the same questions about all of them. And the reason that I'm explaining this is I'm thinking to save some time as I'm having them marked and you get handed them. Keep on looking up the same thing, because the question that I want to find -- these are a bunch of reports that you've authored and I want to find out whether in any of them you ever found that there was a biomechanical failure or injury that resulted from the motor vehicle collision, okay?

A Sure.

(Discussion off the record.)

Q Off the record we discussed this. We're going to mark a bunch of reports all as one exhibit number and then I'm just going to ask you to verify that none of these reports found any biomechanical failures, okay?

A Okay.

Q So the reports that I'm referencing is we've got a report for Khan, Le is two, Osborne is three, Bushdorf is four, LeBaron is five, Jiminez-Garcia is six, Nguyen is seven, Zenner is eight, Fox is nine, Leon-Jenkins is ten, Smart is eleven, Nettles is twelve, Nock is thirteen, Jones is fourteen, Brumfeld is fifteen, Vogel is sixteen, Ehringer is seventeen, Ripley is eighteen, Parkhotyuk is nineteen, Tucker is twenty, Corner is twenty-one, Hughes is

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twenty-two, Hazard is twenty-three.

(Exhibit 15 marked for identification.)

Q So, Mr. Probst, I've attached 23 different reports as an exhibit, and all of these are instances where you've done a biomechanical investigation and found that there were no biomechanical failures; is that correct?

A Correct.

Q And in all of these cases you found that there was no causal link between the motor vehicle collision and the claimed biomechanical failure, as you deem it?

A Correct.

Q And in each of these you specifically detail which biomechanical failures you're looking at?

A Generally that's something I would normally do in a report, correct.

Q So I guess my next question is 23 out of 23 of those things are all coming out no causal link. Did you ever find that there is a causal link between the motor vehicle collision and the claimed injuries or does it just always come out with this result?

A No, it doesn't always come out with this result. I'm looking -- I haven't looked at all 23, but it certainly appears a fair number of these is a Delta-V of 5 miles per hour or less. If we're talking about a rear-end collision with proper restraint and a force of less than that, you

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should expect similar results every time. If I'm getting different results for a similar event, I would be concerned. but if I'm having consistent results for consistent events, that's how it should be. Physics is physics. We can't alter or deny the laws of physics, so we should always have the same type of analyses, same type of results if we're looking at similar events. I haven't looked through all of these to look at the details, but sure, if they're similar events, we should have similar analyses. That's how physics works.

Q Let me ask you this. When you're working -- I should ask this first.

Do you always work for the defense or sometimes do you work for the plaintiff, are you hired by the plaintiff?

A I'm hired by the plaintiff. Just prior to showing up today I was called by a plaintiff's attorney and asked to look at an automotive accident and look at biomechanical failures.

Q What's the approximate ratio of how much time you're hired by the defendant in the case versus the person who's claiming the injury?

A I've been asked this numerous times. I don't keep track of it. It has no bearing on how I do my work. Some time ago somebody told me, I think, roughly it's 70 percent plaintiff, 30 percent defendant. That's all I know.

Q How many current cases are you working on for plaintiffs?

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You mentioned you got hired on, apparently, just recently?

A Correct. Again, it has no bearing on how I perform my analysis. I just look at it scientifically, factually, and whether it's a plaintiff or a defendant, it really has no bearing on how I approach the work, so I don't know.

Q And when you write a report and you're representing the plaintiff, is the format of the report that you write the same as the format of the report that you write when you're working for the defense?

A It depends upon what I've been asked to do. Certainly it's going to follow a similar approach of looking at the forces, kinematics, mechanisms. That's biomechanics. So in that sense, there's definitely going to be a fair bit of similarity.

Q Now, it looks to me from these 23 reports that you have sort of a template that you generally use when you're writing reports for the defense; is that fair to say?

A There's just not much different you can say. A rear-end collision produces the same type of motion, a five-mile-per-hour impact produces the same amount of force, so in some sense, yes, there's going to be a lot of similarities because, again, that's just physics and basic science. There's not a lot that changes in some of these.

Q Perhaps you misunderstood. I asked whether there was a template for your report.

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A For some things, I think. Obviously my education, background, some of those things are the same.

Q If you look at the first two reports in this exhibit, I'm going to set them side by side, and it looks to me that the first page looks exactly the same, only the names of the people up at the top has changed; isn't that true?

A Well, again this is saying thank you for working with us or us working with you, here's who I am, here's my background. So no, that doesn't change from report to report because who I am doesn't change from report to report. I am who I am, as Popeye would say.

Q I'm asking you questions really about your report and the template. So you started with the same Word file when you wrote both of those, is that fair? I mean, you didn't retype the exact same stuff word for word, punctuation by punctuation in those two reports, did you? You used a template; right?

A Correct, or just a report that, I guess -- it's not a template, but it might just be a blank report like this that it has this background and various things.

Q And in looking at these first two reports, you go through the same order in term of your headings, Incident Description, followed by Information Received, followed by Biomechanical Analysis, followed by Injury Summary, followed by Damage and Incident Severity, followed by Kinematic

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Analysis, followed by Findings, followed by Evaluation and Injury Mechanism, followed by Conclusion.

A Correct. It basically follows what we said previously, our steps -- I don't know how many we enumerated, but one through seven, one through eight.

Q So you're either working from the same Word file or a template in Word or something when you go and write these reports?

A We follow the same format, correct.

Q Do you use that same format when you represent plaintiffs and when you represent defendants?

A Again, it basically should be the same. Sometimes we are looking at different things from the plaintiff's point of view, but generally if we're asked is there a causal relationship between a claimed biomechanical failure and this event, because the protocol is the same, we would go through a similar approach.

Q Let me ask you. When you're hired by the defense, do you ever reach the conclusion that the forces were in excess of human tolerance or that the biomechanical failure did occur when you represent the defendant?

A Yes.

Q And when you reach those conclusions, do you still express your conclusions in the same format, a templated report, it's the opposite, instead of saying it didn't occur, you

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say it did occur?
A No. Again, just to be specific, the way this methodology works is if there is no mechanism, then we can rule out a causal relationship. If there is a mechanism, all that we can say, and this is pure science, is that we cannot rule out the potential or possibility that this event did produce a causal relationship. We can't say anything more than that because we can show that it could happen, but that doesn't mean that it did happen. So from a pure scientific view, we just simply say that it cannot be ruled out, just to be scientifically accurate.
Q I think I understand. When you're saying, for example, we cannot establish the causal link, that's meaning no, this did not cause it. But if you're finding the opposite of that, you're not finding that there is a causal link, you're saying a causal link cannot be ruled out?
A We're saying a causal link exists. Whether this event did produce this injury or not, we can't say anything to that effect. We can simply say that the mechanism is possible and that's all we can say. Again, that's pure science. That's all that science allows us to do.
Q So basically what you're saying is that it's impossible to say on a more probable than not basis that a causal link does exist in fact. You can only say on a more probable than not basis that you can't rule it out or that it doesn't

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exist.
THE WITNESS: Can you repeat the question? I just want to make sure I understand it.
(Pending question read back.)
A Just to be clear, this is the means by which I produce the reports. If we're simply looking at pure biomechanics and just biomechanics and saying can biomechanics alone without any other subjective information, circumstantial information, anything else, what does it allow you to do? And it certainly says whether there is or is not a mechanism. And what you can factually do with that is if there's not a mechanism, then you can say something could not have occurred. If there's a mechanism, then something might have occurred. And if we have in some other information that suggests a broken bone, say, that's an easy example, this bone wasn't broken because we're not driving with an open leg fracture in a vehicle, therefore we know it must have occurred in this event and we can show that there's a mechanism and, therefore, we say yes, definitely there is a mechanism and, in fact, this injury or this failure did come from this event.
Q So that makes it sound like for a broken leg you could say on a more probable than not basis that there is a causal link between a collision and a broken leg; right?
A Again, I'm just being clear. If we're looking at just

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biomechanics, and normally that's when I'm writing a report, from that point of view here is what biomechanics tells us. That's ignoring any other subjective information or any other potentially objective information as to the occurrence of the events. We're simply saying from, again, as we enumerated, a force, kinematic, mechanical failure perspective. That's what it allows us to do.
Then if you have additional information, then you can state within a reasonable degree of certainty that, in fact, this did or did not occur in this event.
Q You mentioned with a leg fracture that you could verify it. Is there something different about a leg fracture versus like whiplash symptoms, neck strain or something from a biomechanical perspective?
A Well, there's certainly -- I see a wide range of events and failures. Certainly somebody who is a quadriplegic was not driving a vehicle while they're a quadriplegic, so it's very factual that that quadriplegia occurred at that time, not while they were driving or anything else. So, yes, there are different degrees that can be seen during these events.
Q So can you think of a single instance where you were hired by the defendant in a case and you found that basically there was a mechanism for biomechanical failure and that you could not rule out a causal link to the motor vehicle collision?

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A Certainly.
Q What case?
A I don't know the case name. I know there was one where it was, in essence, what would be for the plaintiff a frontal impact to their vehicle and they had a rotator cuff tear, and so the mechanism did exist for mechanical failure, so it was not possible to rule it out. I think I've had others where people have had some different type of congenital conditions or malformations or non-unions of bones or a surgical procedure sometimes, even, I think, that day of the event, and it doesn't allow us to say there's not this failure mechanism or causal relationship.
Q The one that you're thinking of where it was a front-end collision and the person had a rotator cuff injury, do you remember what kind of vehicle acceleration and speed change you were finding in that case?
A Not as I sit here today, but it was significantly above this. There was significant crush to the vehicle, but I don't -- again, I don't recall a specific number. I just know that we said that there's a mechanism in this event.
Q When you're saying that you found pretty significant crush, are you talking about like the speed change was ten miles an hour and the forces are up around 6.0g's or are you talking about something higher than that?
A Again, I don't recall. I know it was well in excess of what

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we're discussing here today with Ms. Wolf. And certainly just on a big guess basis, I would say it's in excess of 10 miles per hour. It's been a long day, so my memory might be a little faulty at this point in the day.

Q Part of the reason that I subpoenaed your records, your reports from January 1st, 2011 to present is that I wanted to see whether you've been hired by the defendant in some instances and written a report that reaches a different conclusion than these 23 reports that are marked as Exhibit 15. So can you go back and try and find one for me?

A I can try. I know in that particular case the client did not request a report, so it's possible. Sometimes they just simply don't want a report. So I'll look if I can and I can do the best I can.

Q How many reports like this do you write in a given week, month, year, whatever?

A I don't know. Again, it's not something that I keep track of and I don't know if there's anything that is a given day or week that's normal. I think -- I know this week, I think, I've done one or two reports just because a few people had some rushes on things. I don't know if that's normal or abnormal.

Q Isn't that pretty typical that you're doing one or two a week?

A I mean, if I'm given an assignment and it roughly takes,

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depending upon how long, a couple of days' worth of research and analysis, and some do require inspections, we could certainly do one or two a week just on a given time basis, but that's not counting if we're doing any other type of work aside from just this forensics.

Q For how long has that been true?

A I don't know. Again, I would like to say in the last year or two things have been fairly typical. I'd have to go back and actually look to see if that's -- if I had, in essence, a more regular schedule.

Q And even though you don't keep track of it, you could probably recreate it by looking at the e-mails that you sent to your editor, looking at the files that are available on the ARCCA server, and looking at your billing records to see who you have been billing for; is that fair?

A Again, I don't know what our billing records are capable of or anything else. So it's certainly possible to look into those things, but I don't know what the results would be.

Q I'm trying to get an idea here. I've got 23 of your reports that are Exhibit 15. Can you give any estimate as to how many of these reports that look like this involving motor vehicle collisions there are? I've got 23. Are there only 50 that exist in the world or are we talking 500-plus? If you are doing 50 to 100 a year, and think you've been doing this for quite some time because I see these reports,

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there's not many, but I've got some going back to the early 2000s, I'm thinking they are probably in excess of 500.

A Again, yeah, I've been doing this for about 16 years now, so it doesn't take that many per year to add up.

Q This could easily be a universe of maybe 1,500, maybe 2,000?

A I have no way of knowing. Again, I don't honestly keep track of it.

Q Is there anybody else that keeps track of this kind of stuff for ARCCA? Is there anyone that kind of monitors your work, sees how productive you are, sees how many litigation cases you're working on, things like that?

A Not that I know of.

Q Do you have a supervisor, a manager, someone in your office that's sort of your boss?

A No. In my office, no.

Q How about back in Pennsylvania?

A Well, obviously there's the owner of the company, but I don't report directly to anybody.

Q How much of your time do you spend working on forensic legal matters as opposed to doing other things?

A Again, that's not something I keep track of, but again I've been told in the past it's 60 percent litigation, 40 percent nonlitigation, but I have no way of verifying that because, obviously, some of the work that would be nonlitigation or nonbillable work wouldn't be reflected in any billing

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records. If it's nonbillable, I would have no records of that in any billing software, so I don't know of any way to go back and research it, validate it or anything. I don't keep track of it.

Q When you say litigation versus nonlitigation, sometimes you're preparing reports where there's no lawsuit filed and you're just like, for example, making a report to the insurance company; correct?

A Correct. That's certainly something that's not litigation-related.

Q So if you were to break out sort of how much of your time do you think you spend on doing sort of litigation and nonlitigation matters involving car accidents, analyzing biomechanical failures, stuff like that for either a claim or a litigation type context, how much of your time do you spend doing that?

A I have no way of knowing.

Q You must have some -- let me put it this way. I think you've got a better idea than I do because you are you and I'm not. So give me a better idea than what I have currently of, which is no idea. Does it seem to you like you spend all day doing these things or do you just do it once in a while? You can give some idea better than "I don't know."

A Again, some days I'm getting presentations together. I

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haven't been doing as much article writing as I've done previously, but we still do nonlitigation research for private entities, things of that nature, so I don't have a typical day where every day I go in and -- it's not an assembly line. It depends upon what is needed when, what has a deadline when as to what I'm working on, so I don't have a typical day or week.

Q Let me ask you this. In the last week have you done anything other than these sort of forensic analysis of car accident cases for either litigation or pre-litigation matters?

A Well, this week was a little shorter week for me just because my wife had a surgical procedure, so I wasn't in the office quite as much, so I think the majority of this week was doing litigation work.

Q The majority or all of it?

A I'd have to go back and look, but I think it would be the majority, but not all of it.

Q So what else are you working on that's not a litigation or pre-litigation matter involving like a car accident or a slip and fall or something?

A Well, we have some ongoing research with the National Hockey League.

Q Have you worked on that in the last week?

A We're not working on the actual testing. We're moving

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towards a larger project, so it requires some background, some --

Q Have you done any of that in the last week?

A Certainly.

MR. NYE: Let him finish his answers.

Q So aside from the National Hockey League, over the last week what other non-car accident, non-slip and fall, nonlitigation, non-pre-litigation type stuff have you been working on?

A Well, obviously, just around the office, I'm, in essence, the senior member of the office, so there are certainly just other office managerial things to deal with that are nonlitigation, just discussing things with employees and various things like that. I don't keep track of that time, but it certainly is a percentage of my time. I'm trying to think. We had some -- the business development person and I were discussing -- they're planning some seminars or various things like that, so we discussed that. So there's a variety of things that are nonlitigation that are going on, but again I don't have any purpose of noting what percentage is done with the other, so I don't --

Q But I'm trying to figure out. The things that you just described, that just sounds to me like Mr. Nye's in an office, he probably spends some time going and getting lunch or talking to the receptionist or whatever. He doesn't bill

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every minute that he's here, but he's doing legal work when he's here. It sounds to me like you're saying, well, I don't spend every minute that I'm in the office working on this forensic stuff, sometimes I'm like talking to the guy in the office next me or doing something. But are you actually working on anything, like billing for anything other than doing these car accidents or is this like completely your livelihood right now, you're just doing the litigation and pre-litigation reports and depositions and trial testimony and stuff? Is this basically all that you're doing that's like bringing money into ARCCA?

A Well, we were just talking about this past week and the work that I was doing that was nonlitigation and was non-billable. That's why I prefaced it by non-billable work I don't keep track of, so I don't know how to split it up into --

Q Then let me ask you this one. When's the last time you worked on something billable to a client that had nothing to do with litigation, one of these templated reports, a pre-litigation insurance claim file, a car accident, a slip and fall, some kind of biomechanical failure analysis like this?

A I would have to see if I could do a search like that. Again, I don't split things up to litigation, nonlitigation, forensic, nonforensic. So as I sit here today I have no way

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of knowing. That's not how it enters into me in my brain and how it comes back out. I just look at this as biomechanics. I do biomechanics.

Q I'll tell you how it looks to me and you tell me if this is wrong. It looks to my like what you do is you work for defendants in cases and you come in and write reports for defendants and insurance companies in cases, and that's all you do.

MR. NYE: Object to the form; argumentative. Sam, where are we going?

Q I'm trying to figure out -- am I wrong? Is that all that you do productive for ARCCA is you're the person who writes these litigation reports and shows up and testifies in court and shows up and testifies in deposition and that's what you do?

MR. NYE: And he prepares presentations, he's working on things for the NHL. Why aren't you listening to the parts that you don't want to hear?

A That question has been asked and answered. I've told you things that I do that are nonlitigation, nonforensic. I apologize. I don't keep track of things in the manner in which you do. We work differently. I can't explain things differently. While we have different approaches, that's common, that's normal, but...

Q Who are the defense counsel that you work with regularly?

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A I guess I've worked with pretty much everybody in Seattle, a lot of people down in Portland, Oregon. Most of my -- just because I don't care to travel, I have four children, I try to travel less, I try to keep things more in the Northwest, so there's only so many defense attorneys in the Pacific Northwest, but I've worked with quite a variety of them.

Q Because I've got a lot of these reports. A lot of them are either Law Office of Kelley Sweeney or Reed McClure or Allstate In-House Counsel. Are those the offices that you're used to going to and visiting and working with the attorneys at?

A Certainly. Liberty Mutual, Safeco, Liberty Mutual Northwest, State Farm, Allstate, Progressive, PEMCO. I don't discriminate. If somebody calls me and asks me are you physically capable of doing this work, yes. And so if somebody asks me to do some work that I'm capable of doing, I will accept it.

Q Who are the plaintiff lawyers that you normally work with?

A I would have to -- there's not quite as many again, so I'd have to look those names up.

Q Can you name any of them?

A Traynor. I don't think you know him because that was in North Dakota.

Q Can you name me a single plaintiff lawyer in the state of Washington that you've worked with?

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A Not as I sit here today. My mind is starting to turn to mush after being here for this extended time, but I can certainly look up names in the state of Washington at a later time.

MR. ELDER: Let's go off the record.

(Recessed 3:23 p.m. to 3:25 p.m.)

(Exhibits 16 - 24 marked for identification.)

Q So, Mr. Probst, I'm going to hand you a number of exhibits here, these go all the way from 16 up through 24, and I'll tell you what we've got here. We've got 16 and 17 are your report in the Green case and a doctor hired by the defendant in Green who verifies that Green was hurt in the vehicle collision. The next two exhibits, what are 18 and 19, that's your report in LeBlanc and a doctor hired by the defendant in that case who says that LeBlanc was hurt in the motor vehicle collision. Then the next exhibit is your report in Shim and a doctor hired by the defendant in the Shim case who says that Shim was hurt in the motor vehicle collision. And then finally the last three here are your report in Baccay, a doctor hired by the defendant in the Baccay case saying that Baccay was hurt in the motor vehicle collision, and then some photos that you reviewed in the Baccay case.

First of all, are those your reports in those cases?

A They certainly appear to be, yes.

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Q And in each of these situations you've got the defendant hiring a doctor, and the doctor concludes that the person was hurt in a motor vehicle collision when your opinion is that there was no mechanism for biomechanical failure.

And I guess my question is: Do you see any problem with that or does it affect your opinions in any way when the doctors are saying that the person was hurt?

MR. NYE: Objection. We've gone through this, Sam. You did it involving our case, which seems me to be a little more pertinent than these.

Q I just want to find out whether there's anything different between this case and a bunch of these other ones.

A I don't recall if I've seen these other IME reports or not, but no, it doesn't concern me that they have a difference in opinion. My opinion is my own, my own independent analysis. Somebody else's report is not going to sway my opinion because my opinion again is based upon the facts, science, physics, engineering. So if somebody else says something different, I can't -- that doesn't change my opinion because mine, again, are simply what science is telling me.

Q But let me ask a question here about validation. At some point if there's enough counter-examples out there, if there's just a scientist is reaching a conclusion and other people, it's not one or two instances, but over and over and over again there are counter-examples where doctors that are

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trained in doing examinations and drawing conclusions, and even doctors hired by the person who's causing the injury event are concluding that someone's getting hurt in a motor vehicle collision, and you keep saying that there's no mechanism for biomechanical failure, I guess my question is: At some point does it call into question the validation that you're using?

A No, because this isn't validation. I don't see in any of these that they are biomechanical in nature, have conducted any testing to show any kinematics, forces or anything that I've done. I'm validating my work with comparable or similar work. This is not a biomechanical analysis, any of these reports you provided from anybody else. These are medical reports. So I don't validate a biomechanical report with a medical report. That would be probably unsound science to do that. So it might be something you believe because you're not as well educated and informed in the field of science or biomechanics, but that's not how it's done and that's not how somebody would do it.

Q What I'm getting from this is I've come up now with five examples, the Green case, the LeBlanc case, the Shim case, the Baccay case, and the Wolf case, this case, where the defense doctors are all saying that the person was hurt and they were hurt in the motor vehicle collision in question. But what I'm hearing from you is it wouldn't matter if

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there's a thousand instances where doctors are unanimously agreeing that people have been hurt in a motor vehicle collision. As long as they're medical doctors that are saying this and reaching that conclusion, it would never affect biomechanical science in your opinion; is that fair? I mean, if five isn't going to do it, a thousand isn't going to do it either?

A Well, I guess maybe -- I don't want to prolong this any more, but if you're looking at these reports, some of these say there might be some mild straining, which from medical professional verbiage or language, if somebody reports some type of discomfort, to give a diagnosis they will say it's a sprain or strain. In none of these do they say there's some type of mechanical failure and there's an actual mechanism or there is some causal linkage between the two on an objective basis. They're all saying that she says she was hurt, she says it wasn't existing prior to this, it exists after this. These physicians have nothing else to go on other than these individual's words. And if they actually, again, did a biomechanical analysis, they would reach a different conclusion.

We're looking at it from two different points of view. They have a grossly more limited data set than I do because, in essence, they're relying upon subjective information. Here is what somebody told them happened. That's not what

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I'm doing. So you could certainly find quite a number of physicians that will say anything one way or the other because they're simply reiterating what has been told to them.

Q And so that's your opinion is that these doctors that have been hired by the person who caused the motor vehicle accident to investigate whether the person that they hit is hurt or not, that they're just basically -- someone's telling them that they got hurt in the car accident and these doctors are just accepting it at face value without really performing any medical analysis and they're just basically writing it down that that's how it must have happened?

MR. NYE: Objection.

A No. I guess you asked earlier what does biomechanics bring to the table, what does it add. And this is exactly what it adds. So if you go to an IME, they look at medical records and they ask what happened. I was in a car accident. Okay. That's what they have to work with. They're not going out and performing a reconstruction, kinematic analysis, biomechanical analysis. They're relying upon what has been told to them by this individual and they reach their conclusions, again using a differential diagnostic technique that's relying upon subjective information. I'm relying on objective information. I'm using factual information,

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engineering science and physics to add additional information as to what factually did occur.

Q Let me ask you specifically regarding Exhibit Number 24, and those are the photos that you reviewed of the Baccay vehicle; isn't that true?

A Correct, I guess. Without having to go back through my file, I will assume that what you're saying is correct.

Q And, actually, if you take a look at the injury description in your report, which is Exhibit Number 22, that might help you verify that this was, in fact, the Baccay vehicle that was involved in a T-bone collision. The defendant pulled out in front of the Baccay vehicle and Baccay was driving this vehicle and ran into the side of the defendants vehicle, and these are the photos that you reviewed; is that fair?

A Again, I'm assuming this is the vehicle. It appears to be a Honda Civic. I don't have a vehicle ID number or anything else to say specifically. Again, I'll take your word for it.

Q And the air bags went off during this collision?

A That's what is noted in my report, correct.

Q And describe for me the severity of the property damage in Exhibit 24. How does it look to you?

A Well, I prefer to use what's in my report, which is objective and, again, it's quantitative and not qualitative

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of just describing what's shown in the photographs. We performed an energy-based crush analysis and there was significant override/underride due to bumper mismatch, and what we found is that this incident is consistent with a ten-mile-per-hour Delta-V for this vehicle.

Q Was the collision in this Baccay case severe enough that some of the material components of the Baccay Honda Civic failed?

A Certainly, yes, there is some type of mechanical failure to this vehicle.

Q Does this appear to be a collision that's severe enough that the air bags went off as a result of the collision?

A Correct, air bags generally will deploy in the 8- to 14-mile-per-hour range. I think, again, just looking at my report in a very brief fashion, we note a 10-mile-per-hour Delta-V, so that's certainly within that 8- to 14-mile-per-hour range, so it would not be unexpected.

Q And what was the average acceleration of the vehicle that you found?

A Well, we noted it in a peak acceleration, so we have, I think, a peak acceleration of 6.0g's for this incident.

Q I've got to ask you because you called it peak acceleration of 1.5 in this case. So when you're talking about peak acceleration of 6.0 in that case, do you mean that the 6.0 is analogous to the 1.5 or analogous to the 3.0g's of

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acceleration?
A I made myself extremely clear on all these accelerations. I apologize if you're incapable of understanding it, but it's quite clear that this is a 6.0g peak acceleration.
Q So is it comparable to the 1.5 or the 4.0 in the Wolf case?
A You can compare anything. I mean, numerically 1.5 is less than 6.0. That's a comparison. What do you mean comparison?
Q Well, if you're comparing apples to apples, if you're comparing whatever calculation you made, you call it peak here, you called it peak 1.5 in Wolf, so I need to know. If you're comparing apples and apples, if you're comparing the 6.0g's of vehicle acceleration that you found in the Baccay case, is that comparable to the 1.5g's that you wrote in your report in the Wolf case or comparable to the 3.0g's that you've identified in Exhibit 3?
A This is a 6.0g peak acceleration. In Wolf we said 3.0g peak acceleration. Those are the peak accelerations. I've made myself painfully clear. I apologize if you simply cannot grasp these basic concepts.
Q And despite the fact that the vehicle got pretty smashed up and the air bags went off, you still found that there was no mechanism for biomechanical failure in the Baccay case; isn't that true?
A If you read my report, we go into great detail as to why

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that occurs and doesn't occur. If you have anything in my report that you disagree with other than results or conclusions, I'm happy to address them. But it's all laid out there in a scientific basis. If you have something to say that it's scientifically invalid, I'm happy to discuss it.
Q I just want to make sure that I'm understanding. The conclusion that you did reach in the Baccay case was that there was no biomechanical failure that resulted from this collision.
A The actual conclusions, if you'd like me to read all of them, is that on August 27, 2008, Ms. Cayetana Baccay was the belted right front seat passenger of a 1992 Honda Civic that was contacted in the front. The severity of the subject incident was consistent with a Delta-V comparable to 10 miles per hour with peak acceleration comparable to 6.0g for the subject 1992 Honda Civic in which Ms. Baccay was seated. Three, the acceleration experienced by Ms. Baccay was within the limits of human tolerance and comparable to that experienced during various daily activities. Four, the forces applied to the subject vehicle during the subject incident would tend to move the occupant's body forward relative to the vehicle's interior. These motions would have been limited and well controlled by the three-point restraint and seat bottom friction. All motions would be

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well within normal movement limits. And five, there is no causal link between the reported lumbar injuries of the occupant and this reported collision. Ms. Baccay experiences loading on a daily basis greater than that experienced in this incident. An injury mechanism for the claimed thoracic and lumbar injury was not present in the subject incident. There would be no motion of the thoracic and lumbar -- and I think we're missing a word -- spine outside of the normal physiologic range of motion.
Q Is there something in the property damage -- in the Baccay case, is there some property damage that you would expect to see if that collision was bad enough that Baccay actually sustained a biomechanical failure in that collision that we're not seeing in Exhibit 24?
A I'm not sure if you simply are failing to understand how a biomechanical analysis is performed, but we're not simply looking at severity alone. If you read any of these reports you would quite plainly understand that. Certainly if you do increase the severity, as I said, these are nonlinear events, something else could occur. What I analyzed was that specific event. I wasn't ask to analyze some other hypothetical event, so I can't say what we might or might not expect without given specifics to analyze your hypothetical.
Q Are you familiar with the four tendons that converge to form

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the rotator cuff tendon?
A Yes.
Q What are they?
A We have the supraspinatus, the subscapularis, teres minor infraspinatus, I believe.
Q Which of these tendons is most commonly associated with rotator cuff tears?
A I'm not an epidemiologist, I don't look at anything like that, so I don't keep track of that information.
Q Which tendons were involved in Ms. Wolf's rotator cuff tear?
A I would have to go through my file and look at that. If you'd like, I could find my file somewhere on this table and let you know what it is. I didn't commit it to memory for today's purposes.
Q Let me ask you. As part of your analysis does it make any difference which of those four tendons was involved?
A It certainly can. It depends upon, again, the direction of impact the type of analysis we're performing, but it's certainly something that we do look at. Again, that's how you do the mechanical failure. You find out what anatomic structure is damaged and then that structure -- in this case you have various attachment points and that's going to dictate what type of movement or range of movement is allowed and you certainly look at that information.
Q Now, not generally, but specifically in Ms. Wolf's analysis,

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did your work depend in any way on which of the four tendons was torn in this rotator cuff tear injury?
A As I said previously, it's in the file. I looked at that and utilized that in determining what mechanism would be required. Beyond that, I didn't commit it to memory for purposes of today what specific structures were damaged.
Q Let me ask you. Did you indicate in your report which of the tendons were torn for her?
A I don't recall. Sometimes I do note that, sometimes I don't.
Q Can you tell us biomechanically which shoulder positions are usually associated with supraspinatus tendon rotator cuff tear injuries versus infraspinatus tendon rotator cuff tears?
A Generally with the supraspinatus it's something that's generally producing an impingement where you have the arm raised overhead, something to that effect.
Q And the infraspinatus?
A Oh, I would have to again look at a reference. Right now as I sit here today, I don't know as far as just straight mechanical failure compared to normal wear and tear and repetitive stress type injuries. I don't recall as I sit here today and I don't commit everything to memory when I have references.
Q Is it anything that you noted in your report?

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A I don't recall that I noted anything about the difference of those two mechanisms.
Q How much force does it take to cause a rotator cuff tear involving the infraspinatus tendon? Can you describe that for me?
A What kind of event are we talking about, what kind of individual, what kind of pre-existing conditions, what are we dealing with?
Q So in order to answer the question do you need to know all of those answers or do you need to know that data?
A It's certainly -- you've asked a very open-ended question, what does it take to damage something. That's a very incomplete question.
Q Well, I'm just asking you generally to describe it. Can you give us any description of what that -- let me put it this way. Some of the people on the jury, they may have no idea that there even are tendons that make up a rotator cuff. For example, describe what does the infraspinatus tendon sort of look like as it goes into the rotator cuff, how big around is it, what kind of material does it feel like. Can you describe those kind of things?
MR. NYE: Object to the form. There's about eight questions in there.
A Tendons are what are described as thick cartilaginous structures. So for somebody on a jury, if they've --

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they've probably seen it in chicken they're eating and various things like that. I don't recall -- again, it's not something I would commit to memory an exact size of each of these individual tendons. It's not the manner in which biomechanical failure is assessed, so I don't recall as I sit here today.
Q Let me ask you this. The insertion site of the rotator cuff tendon at the greater tuberosity is often referred to as the footprint. Have you heard it describe that way?
A Possibly. I don't know.
Q Do you know how big the footprint is in terms of area?
A If I'm not very familiar with the term footprint, I would not know what they're describing as an area of something I'm not familiar with, no.
Q I won't use the word footprint then. Do you know the area of the insertion site of the rotator cuff tendon at the greater tuberosity?
A As I sit here today, no. Again, it's not something that comes into any biomechanical analyses in the fashion I normally analyze them. If something like that were to come up, I certainly have references that I would look at. It's often said that a good engineer doesn't rely upon memory alone, they actually look to a reference to get an exact value. And that's what I prefer to do and I don't commit a lot of these things to memory because memory can be faulty.

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Q I'm just trying to get idea as to how familiar you are with these things and whether you can just spout it off off the top of your head because you know the anatomy and you know these different tendons like really well and that you've worked on them or whether they're the kind of things that you need to go look up. It sounds like you would need to go look up any of the specific data on these tendons and how the rotator cuff is constructed, how it's anchored and so forth.
A Certainly at this point in this day, of course, it's been a long day and it wasn't something I prepared for. I didn't know we were going to have an anatomy quiz, so I certainly wasn't prepared for that. I was prepared to discuss this event with Ms. Wolf.
Q How about when you authored the report that you put together on Ms. Wolf, did you feel like at that time you had a really good understanding of the anatomy of the shoulder, the way that these tendons come together, did you look specifically at things like the nature of her tear and what kind of force it took in order to be able to tear the specific tissues that she tore?
A Again, it's kind of a compound question, but I don't know -- in this particular case we're looking at what her kinematics are and whether those kinematics allow for any of these significant loading to any of those structures. And

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sometimes the nature of the tear has no -- makes no difference in the final conclusions. I just don't recall exactly what we did and didn't look at, but we certainly were provided significant information, imaging reports that discussed exactly what the findings to her shoulder was. So we had that information. If it was relevant in my analysis, it was utilized.

Q What level of detail did you get into? Did you look at the difference between sort of biomechanical failures involving the supraspinatus tendon as opposed to the biomechanical failures with the infraspinatus or did you just look at the general level of rotator cuff injuries?

A Looked at it on both levels. One, obviously, in a rear-end collision we're not going to expect just biomechanically any type of rotator cuff tears until something unique is occurring. And then if we look at the specific structures that are damaged, that's going to dictate exactly what kind of movement. And there's oftentimes when you look at structures it would show that you would have to have two separate movements and two mutually exclusive directions, and it simply can't be done. I don't always note that in my report. We simply note quite clearly that there's not a mechanism.

Q Is that the kind of mechanism that just wouldn't occur in a rear-end collision?

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A I hate to sound like a broken record, but a rear-end collision does not tell me anything, so I can't answer a question if you haven't given me anything specific.

Q Let me ask it this way. Earlier you talked about the fact that there was a case where there was a front-end collision and a rotator cuff injury and that you could not rule out a rotator cuff injury; isn't that true?

A Correct.

Q And in this case you could rule out a rotator cuff injury involving a rear-end collision. And so I guess my question is: Is there something about the fact that in a front-end you couldn't rule it out, but in a rear-end you could or does it have -- so in other words, is the direction that's important here or is it the magnitude primarily that's the differentiating factor?

A In that particular case, obviously the magnitude was greater, but also the direction was 180 degrees different. So yes, there is a significant different direction of force application, movement of the occupant, and loading to the shoulder. We're talking two vastly different events. Not anything similar. You can't compare the two.

Q Well, I can compare them. You had a front-end with higher magnitude and you had a rear-end with a lower magnitude; isn't that right? Is that correct?

A Correct.

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Q And then in the front-end with the higher magnitude you found that you could not rule out a rotator cuff injury, in the lower magnitude with a rear-end you could rule it out. I've done some more comparison. That's fair, isn't it?

MR. NYE: Object to the form.

A If you wish to make those comparisons, certainly, you can do those.

Q So let me ask you this. If you took the higher magnitude and put that with the rear-end collision, would you not be able to rule out a rotator cuff injury?

A In this particular case, all things being equal, it still would not produce a mechanism if we increased -- it depends upon how much you increase the magnitude because -- again, we've been down this road, that these events are nonlinear. At some point you might expect seat failure, seat collapse, unrestrained occupants, all these various things. But if the seat remains upright and you have no other change other than you've increased the loading to the vehicle, you're still not producing the mechanism.

Q Let me ask you a question generally about rotator cuff injuries and biomechanical failures. When a person has a congenital bony outcropping on the acromion surface, does that increase the likelihood of biomechanical failure?

A It certainly has the potential because now you're creating this natural impingement. Either you have a Type 1, Type 2,

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Type 3 acromion and you've decreased the space. And depending on the type of work you do, the type of movements that you do, the amount that you perform these tasks, and the number of times, all those various things, it certainly can allow for more rapid degenerative changes.

Q But it's not just degenerative. It also would lead someone to be more susceptible to a biomechanical failure from a traumatic event; isn't that true?

A Again, potentially, if you're producing a force in the direction that would already be in that natural impingement area. So you've already started with an impingement, and, obviously, if you have two people, all things being equal, obviously if one starts with a greater impingement and you add additional force, that person should end with a greater impingement.

Q So do you know with regard to Laura Wolf whether she had a bony outcropping on the acromion surface?

A As I sit here today I don't recall. Again, it didn't affect her personal tolerance level based upon the various tasks she could perform and it didn't affect the potential for biomechanical failure in this event.

Q But it would affect her susceptibility to biomechanical failure from traumatic injuries if she did have a bony outcropping on the acromion surface; correct?

A That's a very generic question. Can somebody be injured,

can somebody not be injured is, in essence, what you've asked.

Q I asked about susceptibility. And I think from your prior answers you indicated this someone with a bony outcropping is more susceptible to a traumatic injury?

MR. NYE: Object. The question mischaracterizes his testimony.

A You didn't ask that. From a biomechanical point of view just saying somebody has a variation doesn't tell you anything because you haven't said what the event is, what the magnitude is, what the direction is, anything else. Is it below somebody's personal tolerance level? If it's below somebody's personal tolerance level, they're not going to have a mechanical failure whether they have a bony outcropping or not. So it's not as simple cut-and-dry, black-and-white as you envision. There's more to it than that.

Q Let me ask it little bit differently. If someone has a bony outcropping on the acromion surface and that bony outcropping is creating some level of impingement of the rotator cuff, already doesn't that leave the person more susceptible to a traumatic injury of their rotator cuff as compared to someone that's anatomically exactly the same except they don't have any bony outcropping on the acromion surface and they don't have any impingement?

A I think we answered that question before, that if you have two people and they are both -- the only difference is their bony outcropping, and if you load one person below failure and the other person at the level below failure but the included impingement does raise that level to failure, certainly there's a difference. But if you're still talking we're only looking at somebody with a bony impingement and we know the force level is below their tolerance level, it's irrelevant whether they have that bony outcropping or not.

(Discussion off the record.)

(Deposition adjourned at 3:58 p.m.)

(Exhibits 1 - 14 attached.)

(Signature reserved.)

C E R T I F I C A T E

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I, Elaine K. Rippen, a certified court reporter in and for the State of Washington, do hereby certify:

That the foregoing deposition was taken before me at the time and place therein set forth;

That the witness was by me first duly sworn or affirmed to testify to the truth, the whole truth, and nothing but the truth; and that the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and thereafter transcribed under my direction;

That the foregoing transcript is a true record of the testimony given by the witness and of all objections made at the time of the examination, to the best of my ability.

I further certify that I am in no way related to any party to this matter nor to any counsel, nor do I have any interest in this matter.

Witness my hand this 19th day of August, 2013.

_____

ELAINE K. RIPPEN, CCR
CCR License #2742
Certified Court Reporter in and
for the State of Washington,
residing at Burien.

DECLARATION OF WITNESS

STATE OF WASHINGTON)
) ss.
COUNTY OF _____)

In Re: Wolf v. Stevens
Case No. 12-2-11026-3 SEA
Deposition of: Bradley Probst
Taken: August 8, 2013

Pursuant to the laws of the State of Washington, I declare under penalty of perjury the following to be true:

I have read my deposition and the same is true and accurate save and except for changes and/or corrections, if any, as indicated by me on the CORRECTIONS or CHANGES page herein.

Signed at _____, Washington on the _____ day of _____, ____.

_____
BRADLEY PROBST

(Reported by: Elaine K. Rippen)

NORTHWEST COURT REPORTERS Wolf v. Stevens
Elaine K. Rippen King County No. 12-2-11026-3 SEA
1415 Second Avenue
Suite 1107
Seattle, WA 98101 Depo: Bradley Probst
(206) 623-6136 August 8, 2013

Please make all corrections, changes or clarifications to your testimony on this sheet, showing page and line number and the nature of the change. If there are no changes, write "none" across the page. Sign this sheet on the line provided.

Page	Line	Reason for Change
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See: Wash. Reports 34A,
Rule 30(b), USCA 28,
Rule 30(e)

Signature:_____
BRADLEY PROBST

NORTHWEST COURT REPORTERS
1415 Second Avenue, Suite 1107
Seattle, Washington 98101
(206) 623-6136

DATE: August 19, 2013
TO: SAMUEL ELDER
Law Office of Sam Elder
12716 Northeast 106th Lane
Kirkland, WA 98033

NOTICE RE FILING OF ORIGINAL DEPOSITION

RE: Case Name: Wolf v. Stevens
Venue: King County Superior Court
Case No.: 12-2-11026-3 SEA
Deposition of: Bradley Probst
Taken: August 8, 2013

Enclosed is the original sealed transcript of

BRADLEY PROBST.

The original signature page and changes, if any, received by this office will be forwarded to all counsel.

Elaine K. Rippen

cc: File
Christopher Nye

NORTHWEST COURT REPORTERS
1415 Second Avenue, Suite 1107
Seattle, Washington 98101
(206) 623-6136

August 19, 2013

TO: CHRISTOPHER J. NYE
Reed McClure
1215 Fourth Avenue, Suite 1700
Seattle, WA 98161

RE: Wolf v. Stevens; Case No. 12-2-11026-3 SEA

DEPOSITION OF: Bradley Probst
Taken August 8, 2013

Dear Mr. Nye:

Enclosed is your copy of the above deposition, plus a correction sheet and a declaration. Please have the witness read the deposition, make whatever corrections and/or changes that are appropriate, then sign the correction sheet and the declaration.

Upon completion, please return the corrections and declaration to me at the above address for distribution among counsel and filing. Please be aware that the court rules provide that this be accomplished with 30 days of receipt of this notice, or before trial, whichever occurs first.

Thank you for your cooperation in this matter.

Elaine K. Rippen, CCR

enc.
cc: Court file
Samuel Elder